COTERRA ENVIRONMENT

Extractive Industry Licence Application

Lot 6 Wesco Road, Nowergup

Rev 1, October 2018

CALIBRE | COMMITMENT | COLLABORATION

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This report was prepared for:

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APPENDICES

1.0 INTRODUCTION

Northsands Resources undertake sand and limestone extraction activities at Lot 6 Wesco Road, Nowergup (the site) (Figure 1). Resource extraction has been undertaken at the site for over fifteen years.

The site contains the Northsands extraction areas as well as a limestone quarry on the eastern boundary which is operated by Meteor Stone. The remainder of the site comprises cleared paddocks with scattered trees, with denser remnant vegetation along the western side. An aerial photograph is provided as Figure 2.

The City of Wanneroo has identified that the ongoing operations at the site require an extractive industries licence to be submitted for assessment and approval. This application (Version 1) responds to comment received from the City of Wanneroo (File No. 2017/336. Dated 3 August 2018) and provides the required information necessary for this licence application.

In addition to the City of Wanneroo licence, the site currently holds a Department of Environmental Regulation (DER) (now known as Department of Water and Environmental Regulation-DWER) licence (Licence No.: L7782/2002/6) for the activities listed on Table 1. An Amendment Notice 1 was issued by the DER on 21 March 2017 of the prescribed activities on site, in which the operational licence expires 2 May 2022.

Table 1: DER Licence Categories (as per Amendment Notice 1)

Category Number	Category Description	Category Production or Design Capacity	Premises Production or Design Capacity
12	Screening, etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	50,000 tonnes or more per year	60,000 tonnes per year
13	Crushing of building material: premises on which waste building or demolition material (for example bricks, stones or concrete) is crushed or cleaned.	1000 tonnes or more per year	45,000 tonnes per year
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or reuse.	500 tonnes or more per year	5000 tonnes per year
63	Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	500 tonnes or more per year	20,000 tonnes per year
67(A)	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	1000 tonnes or more per year	60,000 tonnes per year

2.0 SITE DESCRIPTION

Lot 6 Wesco Road, Nowergup encompasses a total area of 91.62 ha. The portion of the site which forms part of this extractive industries licence application is located in the western half of the site, and covers 61.9 ha. This area is shown on Figure 2.

There are two areas of existing operations by Northsands (Figure 2). The material extracted from these pits is fill sand and crushed limestone (19mm and 75mm sizes). This material is generally used in the urban development and building industries.

Infrastructure present on the site includes a transportable site office located in the northern end of the operation area, machinery and maintenance compound and a groundwater bore. Access to the site is available along the access track to the north-west of the main pit which connects to Wesco Road. Lockable gates are present at the entrance to the operations to restrict unauthorised access to the site (Plate 1). The boundary of the site is fenced with post and wire agricultural fencing.

Plate 1: Lockable Entrance Gate

The City requires a Site Plan to accompany the licence application which identifies a number of key items. These items, together with comments on their relevance to the current proposal are summarised on Table 2. The required Site Plan is provided as Figure 3, and includes the locations of the datum pegs.

Table 2: Features of the Site Plan (Figure 3)

CoW Information Required in Site Plan	Response / Comments
(a) The existing and proposed land contours based on the Australian Height Datum (AHD) and plotted at 1 metre contour intervals	Existing contours included on the site plan. Proposed excavation (post-landfill) contours estimated to range between 51m and 76m AHD.
(b) The proposed land contours resulting from extraction. Contours should be based on the AHD, and be set at 1m intervals	The maximum depth of the excavation is 25m AHD. Proposed excavation (post-landfill) contours estimated to range between 47m and 51m AHD, subject to maintenance of 2m groundwater separation. Where possible the final reinstated levels will closely reflect existing ground levels (where undisturbed). Where excavation has occurred on site there will be a smooth integration of contouring with natural ground levels.
(c) Details of the portion of the lot or lots depicting where the disturbance area and extraction area will be located	Included on site plan
(d) All existing and proposed vehicular access/egress points and thoroughfares for vehicle movements within the site	Included on site plan
(e) The location of existing and proposed buildings, structures, storage, crushing and stockpile areas	Only building onsite is the transportable office. Stockpiles are located within the base of the pits. Processing of the extracted material is not undertaken onsite.
(f) The location of existing power lines, telephone cables and associated structures, sewers, pipelines, reserves, bridges, railway lines and registered grants of easements or other encumbrances over, on, under or adjacent to the site	Power and telephone line locations shown on site plan. Other features not present onsite.
(g) The location of existing dams, swamps, lakes, drains or sumps or other watercourses on the site	No surface water or drains present onsite.
(h) Identification of existing flora to be retained	Vegetation present to the west of the existing main pit is not proposed for disturbance. Note included on Site Plan.
(i) The location and description of existing and proposed fences, gates and warning signs	Included on Site Plan

3.0 WORKS AND EXCAVATION PROGRAM

3.1 Nature and Duration of Proposed Works

Sand and limestone extraction has been undertaken at the site for over 15 years. The current application will facilitate the continuation of the existing operations to extract the resource from the site.

The resource will continue to be extracted at the current rates which can be up to 450,000 tonnes/year depending upon industry demand. No change in the existing operations is proposed. It is anticipated that the availability of the resource would support continued sand extraction operations at the site for approximately 25 more years, however please note that this application is only requesting approval for the next 10 years of operation.

The hours of operation of the site are 7am to 5pm Monday to Saturday, excluding public holidays.

3.2 Staging

The future extraction works at the site will continue in an easterly direction. New areas will be opened as the resource is exhausted from the open pit extent. The area proposed for future expansion is identified on Figure 4.

Areas will be progressively filled with inert landfill as they are exhausted, and at any one time the site will have some areas being extracted, some areas being filled with inert landfill, and some areas being rehabilitated.

Based on the proposed depth of works and the rate of extraction it is anticipated that less than 2 ha/year will be needed to accommodate future expansion of the pit, most of which is under pasture

3.3 Extraction Methods and Processing

Excavation methods and process will be the same as is currently undertaken at the site. This consists of:

- Clearing of pasture and topsoil - topsoil is stored in the northern end of the site for future reuse.
- Excavation of sand using front end loaders - the resource is either directly loaded into trucks from the base of the pit, or stockpiled in the base of the pit ready for loading.
- Screening of sand - if the sand is found to contain limestone rubble a mobile screen may be used to remove these fragments. If required, the mobile screen operates in the base of the pit.
- Re-use of pits as landfill - once each stage of extraction is completed, that excavated area is then re-used as an inert landfill as approved by the Department of Environment Regulation.

- Rehabilitation of landfill areas- once the landfill of an area is complete, stockpiled topsoil is re-spread over these areas and pasture species are planted.

In addition to sand, limestone is extracted from the northern end of the site. Crushing and screening of the material is undertaken from a mobile plant (located in the base of the pit). The crushed limestone product is then sold in 19mm and 75mm sizes. These areas are to be filled and rehabilitated in the same manner as the sand extraction areas.

Equipment kept onsite to facilitate the excavation operations include:

- Mobile crushing and screening plant
- Front end loaders
- Water tankers
- Service vehicles

Transport trucks are also owned by the site operator and are parked onsite when not in use.

Water is available onsite for dust suppression if required. This is undertaken through use of mobile water carts.

3.4 Vegetation Clearing

Progression of the extractive industry operation onsite will require clearing of paddock trees located to the east of the main pit. These trees will be removed through mechanical methods.

Management relevant to the vegetation clearing process is discussed in Section 4.4.

3.5 Topsoil and Overburden Management

Following clearing, topsoil is removed and stored at the northern end of the site. The location of the existing topsoil stockpiles are identified on Figure 3. Topsoil is later re-spread to cover the completed landfill areas.

There is no overburden present between the topsoil and the resource.

3.6 Site Access

Access to the site is via the sealed access road located to the north west of the main pit (Plate 2; Figure 2). This connects the operational area to Wesco Road. The access road has been present and used for operational purposes since excavation commenced.

Internal site access is provided along the pit boundary and central tracks. The location of the current track networks is shown on Figures 2 and 3.

Locked gates are present between the site and Wesco Road to prevent unauthorised access (see Plate 1).

Plate 2: Site Access Road

3.7 Transport

Truck movements are variable from the site in response to demand for the resource. On average, there are approximately 20 truck movements per day (one truck movement is defined as a truck entering, being loaded and then leaving the site) associated with both the existing and the proposed sand extraction operations.

Trucks entering and leaving the site generally travel west along Wesco Road and Nowergup Road to Wanneroo Road. Trucks then turn either north or south depending upon the material destination. The distance from the site access point to Wanneroo Road is approximately 1.6km.

3.8 Buildings and Structures

The only building present onsite is the transportable site office located in the north western corner of the site. This building has been in place since 2007. A photograph of the site office is provided below.

Plate 3: Site Office

A diesel storage tank is also located onsite for machinery refuelling purposes. This is located within the machinery compound. Truck maintenance is undertaken within the undercover maintenance area within the machinery compound. A photograph of the maintenance area and the above ground fuel tanks is provided in Plate 4.

Plate 4: Above Ground Fuel Storage Tank and Machinery Maintenance Area

A groundwater abstraction bore is located on the site. This supplies water for dust suppression as needed.

No additional buildings or structures are present or proposed to be constructed onsite.

3.9 Management of Visual Impacts

The site is not located within a Landscape Enhancement Area as identified by the City of Wanneroo under Local Planning Policy 5.4.

The site is setback approximately 500m from Wesco Road. The land between the site and Wesco Road is vegetated and rises in elevation to 80-100mAHD (Figure 5). As such the operations are not visible from Wesco Road.

The smaller rural landholdings to the west of the site are at a lower elevation than Lot 6. A vegetated buffer is retained between the main pit and the neighbouring properties. The elevation of this buffer zone and the presence of vegetation provides a visual screen to the operations from this area.

Trees have been planted along the southern boundary of the site and this planting program is ongoing. This tree belt has been designed to provide further screening of the operations.

The facility does not operate at night. As such there is no potential for visual impacts associated with light spill.

The majority of onsite operations are undertaken in the base of the pit which is restricted from view (Plate 5).

Plate 5: Site Operations within the Pit

3.10 Chemical Use and Storage Onsite

There are no chemicals used as part of the sand extraction activities undertaken onsite.

Diesel fuel is stored in an above ground fuel storage tank located in the machinery compound. Small amounts of other machinery fluids (oils, coolant, etc.) are used onsite for minor vehicle maintenance. These are stored within locked sea containers within the machinery compound (see Plate 4).

4.0 ENVIRONMENTAL MANAGEMENT PLAN

4.1 Physical Environment

4.1.1 Climate

The Perth Metropolitan Area experiences warm dry summers and cool wet winters. Climate averages for the region (as taken from the Perth Airport weather station) are as follows:

- Mean annual rainfall – 770mm
- Mean daily evaporation – 34mm
- Mean January (summer) maximum temperature – 31.7 °C
- Mean January minimum temperature – 17 °C
- Mean July (winter) maximum temperate – 17.8 °C
- Mean July minimum temperature – 8.0 °C

The annual rainfall distribution is shown on Chart 1. Average wind speed and wind direction information is provided on Charts 2 to 5. This data is sourced from the Bureau of Meteorology (2015).

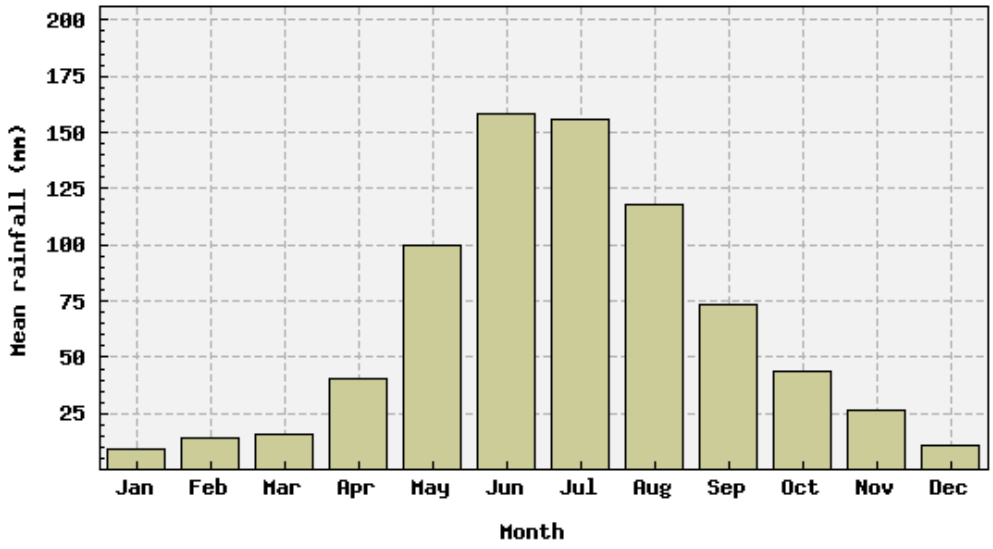

Chart 1: Annual Rainfall Distribution

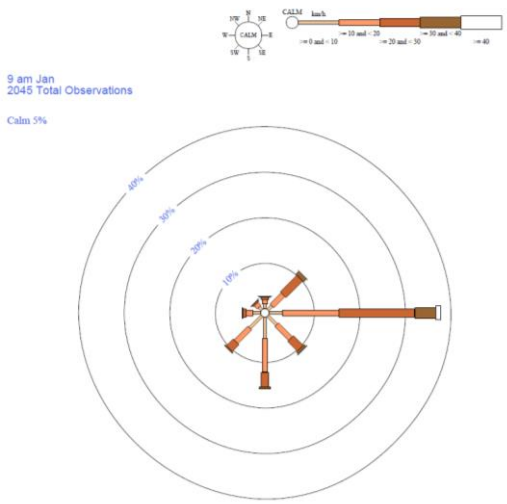

Chart 2: Wind Speed and Direction – summer morning (9am January average)

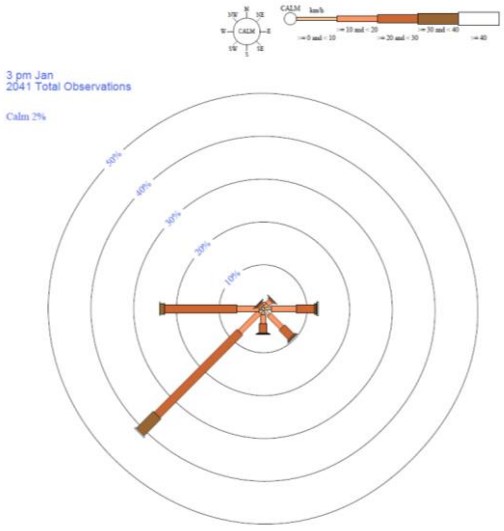

Chart 3: Wind Speed and Direction – summer afternoon (3pm January average)

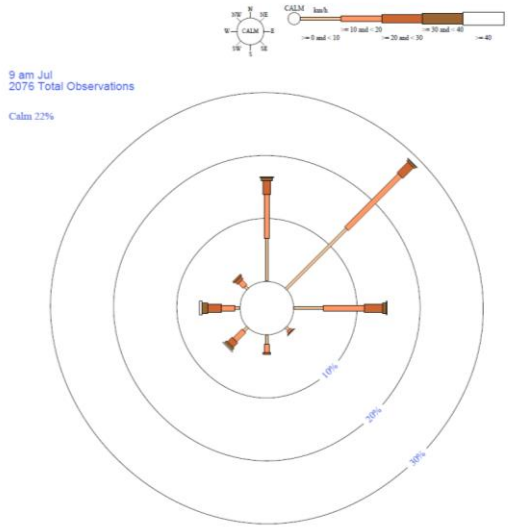

Chart 4: Wind Speed and Direction – winter morning (9am July average)

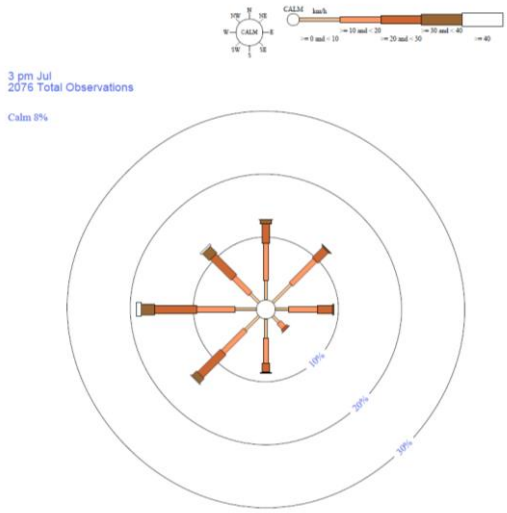

Chart 5: Wind Speed and Direction – winter afternoon (3pm July average)

4.1.2 Topography

The elevation at the site ranges from 75mAHD in the north east to 40mAHD within the base of the main pit. The western side of the site of the site increases to an elevation of 65mAHD. Topographic contours are presented on Figure 5.

4.1.3 Soils and Geology

The environmental geology mapping produced by Geological Survey of Western Australia identities that the geological unit present within the proposed excavation area is Sand (S7) which is described as:

- Sand (S7) – pale to olive yellow, medium to coarse-grained, sub-angular quartz with a trace of feldspar, moderately sorted, of residual origin (Gozzard, 1982a,b).

Two limestone based units are located along the western boundary of the site but not within the proposed excavation area. These are identified as (Gozzard, 1982a,b):

- Limestone (LS1) – light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, a trace of feldspar, shall debris, variably lithified, surface kankar of eolian origin.
- Limestone (LS2) – light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin, abundant karstic.

Soil and geology mapping is provided on Figure 6.

Soils at the site are indicated as having no known risk of Acid Sulfate Soils (Landgate, 2015). The closest 'high to moderate' risk area is located approximately 500m west of the site boundary (Figure 6).

A photograph of the soil profile at the site is provided in Plate 5.

4.1.4 Hydrology

Average annual maximum groundwater levels in this area occur at approximately 22 to 27mAHD (Figure 10), which is approximately 12-43m below natural ground level, and 16m below the base of the main pit. Regional groundwater flow direction is westerly.

In accordance with the sites, DWER Operational Licence a groundwater monitoring program has been established on site by monitoring bore locations which includes biannual measurements of groundwater levels and chemical parameter analysis. A suite of chemical parameters from bore samples are tested in a NATA accredited laboratory and are reported to DWER in an annual report. From 2015 to 2017 these parameters have fluctuated but remained relatively consistent across testing events (Appendix B).

The implementation of the groundwater monitoring program ensures the minimum groundwater separations distance to the pit floor is monitored and achieved. As per Operation Licence conditions an annual audit report is provided the DWER to ensure and demonstrate compliance with licence conditions.

There are no wetlands present onsite. The site is not located within a Public Drinking Water Source Area.

4.2 Biological Environment

4.2.1 Vegetation and Flora

The original vegetation complex present at the site is mapped as the Cottesloe Complex – central and south which is described as an open woodland of *Eucalyptus gomphocephala* (Tuart), *E. marginata* (Jarrah) and *Corymbia calophylla* (Marri) with a closed heath on the limestone outcrops (Heddle et al., 1980).

The majority of the site was cleared of vegetation prior to 1965 and used for agricultural purposes.

The vegetation remaining onsite consists of a heathland to the west of the main pit (not proposed to be disturbed), and scattered paddock trees within the cleared areas. The extent of vegetation remaining onsite is shown on Figures 2 and 8. Photographs of the vegetation are provided in Plates 6 to 8.

Plate 6: Western heath vegetation

Plate 7: Example Paddock Trees

Plate 8: Example Paddock Trees

4.2.2 Fauna and Habitat

A search of the Department of Parks and Wildlife (DPaW) (now known as Department of Biodiversity conservation and Attractions- DBCA) NatureMap database identified that the fauna species of conservation significance which may occur in this area include:

- Carnaby's Black Cockatoo
- Western Brush Wallaby
- Rainbow Bee-eater

The habitat requirements for these species and potential for occurrence onsite is summarised in Table 3.

Table 3: Habitat Requirements for Fauna Species of Conservation Significance

Species	Habitat	Potential for Occurrence onsite
Carnaby's Black Cockatoo (*Calyptorynchus latirostris)* *Listed Endangered (EPBC Act); Schedule 1 (rare and likely to become extinct) (WA)*	This species tends to be residential in high-rainfall areas, but where it occurs in drier, eastern areas, it migrates to coastal areas where rainfall is higher after the breeding season (winter to spring) (DotE 2015). It inhabits remnant native eucalypt woodlands, primarily in the semi-arid region and southern jarrah-marri forests, though in lower abundance here than Baudin's black cockatoo (Cameron 2007). It is a seasonal visitor to pine plantations where it feeds on pine seeds. It nests in tall eucalypts with hollows for breeding, and this habitat requirement is the limiting factor to the range of the species. Carnaby's black cockatoo feeds on seeds, nectar and fruit, particularly of *Banksia*, *Dryandra*, *Pinus*, *Eucalyptus* and *Corymbia calophylla*. Often in black cockatoo habitat areas, fruit can be	Heathland to the west of the quarry is likely to provide habitat opportunities for this species. This area is not proposed to be disturbed by onsite works. The proposed expansion area is mostly cleared with limited paddock trees present. Any potential habitat is in area is limited.

Species	Habitat	Potential for Occurrence onsite
	found surrounding the base of trees that appear to have been chewed and detached from the tree (DotE 2015).	
Western Brush Wallaby (*Macropus Irma)* *Listed Priority 5 (in need of monitoring – conservation dependent) (WA)*	The western brush wallaby is distributed from Kalbarri in the north-west to Cape Arid National Park in the south-east. Its pre-European distribution has been severely reduced and fragmented due to clearing for agriculture. It prefers open forest and woodlands as habitat, often inhabiting seasonally wet flats with open thickets. It is diurnal in nature, and is more active during the early evening and late afternoon than at other times of the day. It feeds on plants species (DEC 2011).	Suitable habitat not available onsite.
Rainbow Bee-eater (*Merops ornatus)* *Listed Marine, Migratory (JAMBA) (EPBC Act)*	The rainbow bee-eater is a migratory terrestrial bird that migrates between Australia, Eastern Indonesia and Japan. The population size of this species within Australia is not known, but is assumed to be quite large. It is known to occur across the majority of the mainland, but is very thinly distributed in the arid zone of central Australia. The bee-eater occupies open woodlands, including cleared or semi-cleared areas such as farmland. It prefers timbered landscapes, often occurring in close proximity to water. In northern WA, it often occurs in mangrove forests. A bee-eater nest consists of an enlarged chamber at the end of a long burrow that is excavated from flat or sloping ground, cliff faces or mounds of gravel, usually unlined. It perches in the open, foraging by scanning for flying insects (DotE 2015).	This species is common and widespread. As such impacts to the species, if they did utilise sandy areas onsite, would not be expected from the proposed operations.

Given the habitat requirements of the species listed in Table 3 and the condition of the environmental site features within the proposed extraction expansion area it is not anticipated that these species will be affected by the proposed operations.

4.2.3 Conservation Areas

A number of Bush Forever sites are located in the vicinity of the site as follows:

- Site 383 located approximately 1.3km west of Lot 6
- Site 293 located approximately 900m south of Lot 6
- Site 384 located approximately 950m south of Lot 6
- Site 290 located approximately 1.1km north of Lot 6
- Site 136 located approximately 1.2km north east of Lot 6

The location of these sites is shown on Figure 9.

The City of Wanneroo Local Biodiversity Strategy mapping indicates that Lot 6 is not located within an ecological linkage. Regional Ecological Linkages are located to the east and west of the site, with a local ecological linkage located to the immediate west and north (Figure 9).

Vegetation surrounding the site is identified by the City of Wanneroo as part of a local natural area (CoW, 2011). The CoW objective is for retention of these areas where possible. The proposed quarry expansion area is not mapped as a Local Natural Area. Local Natural Area mapping is included on Figure 9.

4.3 Cultural Environmental

4.3.1 Surrounding Land Use

Lot 6 is located within a rural land use zone under the City of Wanneroo Town Planning Scheme No. 2. Surrounding land uses include:

- Meteor Stone limestone quarry within the eastern portion of Lot 6
- Remnant vegetation to the north and east
- Smaller size rural landholdings to the west and south, which include areas of market gardens
- Poultry farm sheds to the south

The closest residential dwellings are located to the west (260m north-west of the site office) and south of the Lot (100m south of the pit boundary).

4.3.2 Aboriginal Heritage

The database polygon for Aboriginal heritage Site 4404 includes a portion of Lot 6. Investigation into the site identifies it as the Orchestra Shell Cave which is registered for its artefacts/scatter and engraving. This cave does not occur within Lot 6.

The database polygon for Lake Neerabup (ID 3693) which is listed as an 'Other Heritage Place' also overlaps the southern boundary of Lot 6. This lake is located more than 1km south of Lot 6 and will not be impacted by the proposed operations.

A copy of the DAA database search results is provided in Appendix C.

4.3.3 European Heritage

No site of European heritage significance are registered within the site.

4.4 Biodiversity Management

4.4.1 Flora and Vegetation Management

Clearing of paddock trees, when required, will be undertaken by mechanical methods. Once cleared the green matter will be stockpiled for disposal with any green waste material which has been received by the landfill operations.

Should unauthorised access become an issue at any stage of the operations, cleared tree trunks will be used to lay across unauthorised access routes to discourage vehicle movement in these areas.

Native vegetation along the western side of the site is not proposed to be cleared. Protection of this vegetation will be achieved through minimising access within this area to operations through existing rock barrier(s) (refer to Plates 9 and 10) including firebreak management and groundwater monitor bore data recording.

Plate 9: Existing Rock Barrier (limited access to vegetated area)

Plate 10: Existing Rock Barrier (limited access to vegetated area)

All workers onsite are informed that the western heathland is not to be accessed. Vehicles used as part of the onsite operations are restricted to designated quarry/landfill access tracks and pit areas.

Trees planted along the southern boundary of the site are within the 30m works exclusion zone designated along lot boundaries. Additional tree planting is proposed within this area as part of the ongoing operations of the site. Tree species planted in this area will include *Corymbia calophylla* (Marri), *Eucalyptus marginata* (Jarrah) and *Eucalyptus gomphocephala* (Tuart) towards the western side of the site. These species are naturally occurring in this area and additional planting will complement the remnant vegetation present in this general area.

Prevention of weed spread onsite is part of the general site management actions. Steps undertaken to assist with this task include:

- Access to vegetated areas onsite discouraged through maintenance of boundary fencing and avoiding track creation within this zone. Access only permitted for authorised individuals to undertake designated activities including firebreak management and monitor bore assessment.
- All vehicles and equipment used during firebreak maintenance, land clearing or land reinstatement are to be clean and free from soil or plant material when entering these areas onsite.
- Any declared plants as listed by the WA Department of Agriculture and Food which are identified onsite are removed by digging out or spraying as appropriate for the particular species.

4.4.2 Dieback Management

Dieback is a significant threat to vulnerable plants and plant communities in areas receiving at least 400mm annual rainfall. Plants under threat from the disease include the Eucalyptus (Myrtaceae) particularly *Eucalyptus marginata*, Banksia family (Proteaceae), Heath family (Epacridaceae) and Pea family (Papillionaceae) (DEC, 2012).

A number of paddock trees displayed signs of poor health during the site inspection but it is not clear if this is related to dieback or a result of other stress factors.

The '*Managing Phytophthora Dieback – Guidelines for Local Government*' (Dieback Working Group, 2000); '*Managing Phytophthora Dieback in Bushland – A guide for landholder and community conservation groups'* (Dieback Working Group, 2008) and '*Management of Phytophthora Dieback in extractive industries'* (Dieback Working Group, undated) have been used as a guide to develop the dieback management procedures for the site. Specific management procedures proposed to prevent the potential spread of dieback to or from the site include:

- Boundary fencing is maintained to prevent unauthorised access.
- Site access track comprises a limestone base. Limestone has a high pH and as such is suppressive of *Phytophthora* dieback.
- Haulage trucks generally run along bitumen roads to their destination and return which is anticipated to be associated with a lower risk of dieback spread. Recognising this, but as a precaution, haulage trucks are restricted to dedicated tracks only.
- Access to the western vegetation area is discourages via external fencing and avoidance of access tracks within this area.
- Vehicles used to clear firebreaks will be clean prior to entering the rural portion of the lot.
- All vehicles and equipment being used during land clearing or land reinstatement are to be clean and free from soil or plant material prior to arriving at the site.
- Any plants or soil brought into the site for rehabilitation purposes are to be from dieback free sources.

Information in relation to dieback management is included in the site induction package.

4.4.3 Fauna Management

Given the limited occurrence of fauna habitat within the proposed quarry expansion area, management of potential impacts is focused on clearing protocols during removal of paddock trees.

Where possible, clearing of paddock trees will be undertaken outside of the main breeding season for bushland birds (i.e. between July and November), to avoid inflicting damage to nesting birds and their young. If this timing cannot be avoided trees will be inspected for nests, and if found eggs/birds these will be removed prior to clearing. In addition clearing will be undertaken it the direction of remaining vegetation to assist fauna movement to these areas.

Should any injured, abandoned or distressed fauna be found onsite the following protocol will be enacted:

1. Animal found.

2. Site supervisor to be alerted to animal presence.

3. Contact the DPaW Wildcare helpline (9474 9055) for advice.

4. If unable to stay near the animal, clearly mark its position so it is visible to all personnel that approach the site.

5. First preference is to leave the animal alone until experienced assistance arrived. If this is not possible the following handling and temporary holding instructions may be enacted (only if absolutely necessary and only as a last resort):

   - Nesting birds (and all avifauna) are protected by the *Wildlife Conservation Act 1950-1979* and should be left undisturbed until an appropriate course of action has been followed. Young birds found within a nest should only be removed if considered by a specialist to be abandoned or injured.

   - For any small mammals found at any time on site, the best method of storage and transportation would be within hessian sacks. Mammals may become stressed and agitated in traps or hard containers, sometimes resulting in injury. Mammals transported in hessian sacks remain calmer due to the dark environment and if kept in the shade and on a soft, secure surface can be transported with relatively limited stress and injury.

   - Reptiles can, in most cases, be transported within calico bags of varying size to suit the animal. Plastic carry boxes can also be used with some air holes, leaf litter and sand within them. The animals should always be placed within an area of shade so that they do not overheat.

6. If in any doubt about whether the animal is venomous, do not under any circumstances attempt to handle. Instead, monitor the location of the animal and await arrival of an experienced wildlife officer or reptile handler.

7. Document the situation and the actions undertaken.

This protocol will be included in the site induction information, with a copy of the instructions available in the site office.

4.5 Drainage Management

4.5.1 Drainage Characteristics

As described in Section 4.0, soils within the proposed excavation expansion area are predominantly sands which have a high infiltration capacity. As such infiltration is the dominant drainage process in the landscape. It is further noted that there is a large depth to groundwater at the site (12-43m below ground level) which further assists the infiltration capacity of the site.

The site does not contain any wetlands or surface water features. The site water supply is provided via the onsite groundwater bore.

Drainage management at the site is undertaken through the following:

- All stormwater is contained and infiltrated onsite.
- The entry road is not kerbed which facilitates infiltration of runoff at source.
- No hardstand areas have been or will be constructed at the site.

- Rainfall falling on the site office roof is directed to the ground adjacent to the site office for infiltration.

- Any ponding on compacted access ways drains via infiltration at slower rates, evaporation or runoff to the side of the tracks as is the case in most rural areas.

- Pit areas are internally drained to their base.

As such it can be seen that natural infiltration opportunities will continue throughout the operation phase as is currently the case.

4.5.2 Refuelling

All earthmoving equipment is fuelled from the diesel storage tank located within the machinery compound. Mobile equipment is re-fuelled by hand within the quarry.

Spill kits are kept on site, and the following steps are taken in the event of a spill:

- Shut down the equipment that was the source of the spill
- Isolate the equipment
- Confine the spill
- Clean up spill with appropriate spill kit
- Remove contaminated material to Tamala Park Waste Disposal Facility.

4.6 Fire Management

The site complies with the City of Wanneroo rural land fire management requirements which include maintenance of a minimum 3m wide firebreak around the perimeter of the site. The firebreak is renewed prior to the 15th November each year.

During days where a Total Fire Ban is in place as advised by the WA Department of Fire and Emergency Services (DSES) or a Harvest, Vehicle Movement and Hot Works Ban is issued by the City of Wanneroo, vehicle movement is restricted to the quarry area only, and vehicles will not enter bush or paddock areas.

At least once per year a controlled burn is undertaken at the site to remove potential green waste fire hazards. The procedure for controlled burns is:

- Obtain a fire permit from the City of Wanneroo Ranger or Two Rocks Fire Service. The permit will be open for one month which allows selection of a day with suitable weather to undertake the burn.

- Inform the DER Greater Swan Team Leader, property neighbours and any other groups noted on the fire permit prior to commencement of the controlled burn.

- Green waste only is selected to burn. The material is placed in a safe area away from other flammable items. This is generally within the base of the quarry which is a sheltered location.

- Large capacity water tanker remains on stand-by during the controlled burn.

In addition to the above, the following fire management measures are undertaken at the site:

- In an emergency access to/from the site can be provided through the main site access track and the accessway to the adjacent Meteor Stone quarry. There is also a gated access to the farming property to the south which could be utilised as an escape route if required.
- Emergency muster area is defined at the site office for site workers and visitors in the case of an onsite incident, including a fire.
- Fire extinguishers are provided in all vehicles operated onsite.
- A water supply is available onsite through access to the onsite bore.
- Excavation machinery and equipment is restricted to the quarry work area which has been cleared of vegetation.
- Fuel storage (diesel) is within the machinery compound which is locked at night and on weekends.
- Radio communication is used onsite to maintain contact between the site office, onsite workers and haulage trucks.

4.7 Dust Management

Dust has the potential to be generated from operations onsite, particularly during summer. The main risk for dust generation is from tipping, screening processes and vehicle movements.

Wind roses for Perth Airport (see Section 4.1.1) indicate that the strongest winds are easterly in summer mornings and from the south-westerly in summer afternoons. There are no residential dwellings to the east of the site, with the closest residential dwellings located approximately 270m north-west of the site office (topographic ridge present between the site and this area) and 100m south of the pit boundary (adjacent to the poultry sheds).

A complaints register is maintained for the site. No dust complaints have been received since Northsands have operated the site (since 2007).

Actions undertaken to manage potential dust generation at the site include:

- Visual monitoring undertaken by all site personnel.
- A dedicated water truck is retained onsite for wetting down of roads and operations areas if dust nuisance occurs.
- Sprinkler system is located along the road adjacent to the site office for use if required.
- When undertaking activities which are more likely to generate dust (e.g. crushing or screening) a sprinkler system is available to be set up on the machinery to minimise dust generation on days when this may be an issue.

- Reduced speed limit of 15km/hr is applied to the site access road to assist to minimise dust and noise generation.
- Condition of site access road is maintained to minimise dust generation. This is also a condition of the DER landfill licence which states '*The licensee shall pave, seal or otherwise treat all trafficked areas, and maintain them in a manner which minimises airborne dust generation*'.
- Maintenance of a tidy site to avoid accumulation of waste materials. The DER licence also reflects this action which the following condition '*The licensee shall employ routine maintenance and housekeeping practices to ensure that there is no accumulation of waste materials in or around the site which may lead to the generation of airborne dust*'.
- Loads on trucks are required to be covered prior to exiting the site
- Vegetated setback to the west is maintained within the site design.
- Operations are undertaken on the pit floor whenever possible to avoid exposure to surface winds.
- Mobile plant and stockpiles are located in the pit floor area whenever possible.
- Awareness of dust issues and management requirements is included in the site induction.
- Topsoil and overburden stripping is scheduled for low wind and/or damp weather conditions when dust generation risk is minimised.
- A berm for noise and dust suppression has been constructed where the access road meets the Lot 6 boundary.
- Tree planting is undertaken along the property boundary to increase the screening to the neighbouring properties.

4.8 Noise Management

The hours of operation of the sand extraction operations are 7am to 5pm Monday to Saturday, excluding public holidays. This is similar to operations of nearby quarries in the local area.

No noise complaints have been received for the existing operations since the site has been operated by Northsands Resources (2007). The operations proposed for the quarry expansion will not differ from the operations currently undertaken onsite.

As is currently the case, the following noise minimisation actions are undertaken at the site:

- Potential noise generation timeframe is restricted to operating hours only.
- Operations, including screening and processing, are undertaken within the base of the pits whenever possible, to assist to minimise noise exposure external to this area.

- The site access road is maintained regularly to minimise noise generation by trucks entering and leaving the site.
- Maximum speed limit on the site access road is restricted to 15km/hour.
- Drilling and blasting activities are not undertaken at the site.
- A vegetated buffer zone is maintained between the operational area and the residences located to the west of the site.
- A berm for noise and dust suppression has been constructed where the access road meets the Lot 6 boundary.
- Noise minimisation management is included in the site induction package.
- Workers onsite are provided with personnel protective equipment including ear protection.

A complaints register will continue to be maintained for the site and any noise complains, if received, will be investigated.

4.9 Traffic Management

No changes to traffic associated with the proposed operations, as compared to the current situation, is proposed. Key management actions in relation to traffic include:

- Vehicle crossover to Wesco Road is sealed and maintained in a good condition.
- Onsite speed limits are restricted to 15 km/hour.
- Truck movements are restricted to the site operating hours.
- Communication is maintained with all vehicles onsite via radio contact.

4.10 Cultural Heritage Management

There are no sites of Aboriginal or European heritage identified within Lot 6.

Part IV of the WA *Aboriginal Heritage Act 1972* protects all Aboriginal heritage sites, whether they have been identified or not. Under Section 17 of the Act it is an offence to conceal, or knowingly damage or alter an Aboriginal site, unless authorisation is received from the Registrar of Aboriginal sites or consent is obtained from the Minister for Indigenous Affairs.

If any potential Aboriginal sites are uncovered during site operations the following procedure will be followed:

- Work will cease immediate within this area.
- The area will be isolated and the Department of Aboriginal Affairs will be contacted to inform them and seek guidance on how the area should be treated.
- No further works will take place in this area until approved.

5.0 KARSTIC FEATURES REVIEW

Karst features may be present within Tamala Limestone geology along the Swan Coastal Plain. The Tamala Limestone is a porous rock prone to solution by weakly acidic water such as groundwater and rainfall. These waters circulate through cracks and pores within the limestone aiding the carbonic acids in these waters to remove the calcium carbonate from the limestone by solution, which is known as karst weathering (Csaky, 2003).

5.1 Desktop Risk Review

As described in Section 4.1 soils within the proposed excavation area comprise Sand (S7) which is described as pale to olive yellow, medium to coarse-grained, sub-angular quartz with a trace of feldspar, moderately sorted, of residual origin (Gozzard, 1982a,b). This soil unit is not identified as containing karstic features.

Two limestone based units are located along the western boundary of the site (Figure 6) but not within the proposed excavation area. These are identified as (Gozzard, 1982a,b):

- Limestone (LS1) – light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, a trace of feldspar, shall debris, variably lithified, surface kankar of eolian origin.
- Limestone (LS2) – light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin, abundant karstic.

The compositions of LS1 and LS2 are similar, however the LS2 unit has a greater carbonate content (approximately 80%) enabling it to go more easily into solution (Bastian, 2003). As such this unit marks a karst belt and displays sinkholes and caves (Csaky, 2003).

Detailed Karst risk assessments have been undertaken for the region by the City of Wanneroo (2012) and Geoscience Australia (Csaky, 2003). Both studies identify that a zone of high Karst risk is located along the western boundary of the site but not within the proposed excavation area (Figure 7). The CoW mapping also defines medium risk karst zones, which is within the proposed excavation area.

5.2 Specialist Review by Western Geophysics

A Desktop Karst Assessment Study was undertaken for the project by Western Geophysics (2015). The study involved review of the available background information, as well as analysis of high resolution orthophoto images and digital elevation data.

The study concluded that:

- There is nothing definitive in the data reviewed for the study or the analysis results that directly indicate the presence of karst or karst structures within the application area.

- Karst structures are noted by Geological Survey of WA (GSWA) as being located approximately 30m west of the application boundary.

- Analysis of the site geomorphology, surface slope and inferred water flow directions indicate that there are two closed basin surface depressions where run-off water may accumulate and infiltrate to the east of the existing pit (greater than 80m east of the pit). There is potential that karst may form in these areas, although presence of karst features is not confirmed.

On the basis of these results it is proposed that once the excavation extends greater than 80m east from the existing pit boundary, this closed basin surface depression area should be analysed via Electrical Resistivity Tomography (ERT) to assess the potential presence of any karstic features. Results will be reported to the City of Wanneroo prior to excavation commencing in this location.

The Karst study also recommends investigation into the location and possible size of the caves which are located to the west of the current pit. As the pit is not proposed to be expanded in a westerly direction, this assessment is not proposed to be undertaken. When the ERT study is undertaken for the eastern area of the site these karst features will be reviewed at the same time to classify the karst form in this area.

A full copy of the Desktop Karst Assessment Study is provided in Appendix D.

5.3 Conclusions

Excavation is proposed to initially continue within the areas not associated with the two closed basin surface depressions. Prior to excavation works approaching this area ERT analysis will be undertaken to confirm if any karst features are present in this zone. The results of the ERT investigation will be discussed within the City of Wanneroo prior to excavation commencing in this area. It is not envisaged that the excavation stages will approach this area for at least 5 years as the excavation strategy is to avoid and isolate any karst areas until they are required.

6.0 REHABILITATION AND DECOMMISSIONING PLAN

6.1 Proposed End Use

Once the sand resource is removed from the site, the remaining pits will then be filled as part of the inert landfill operations which are approved for the site. A copy of the DER licence in relation to the landfill operations is provided in Appendix A. The requirements in relation to this licence include:

- Waste acceptance and management conditions
- Conditions to control windblown waste
- Maintenance of a waste inventory
- Fencing of the landfill site
- Maintenance of buffers
- Maintenance of a complaints register
- Dust and odour management requirements
- Groundwater monitoring requirements.

Once the landfill operations at the site have been completed the land use is then proposed to be returned to rural pasture land.

6.2 Reinstatement of Site Topography

Reinstatement of topography will be achieved through import of inert landfill material, with the final land surface capped with a minimum 500mm of sand cover (topsoil). The final topographic elevation is planned to vary from approximately 51 to 76m AHD, to reflect the general pre-development landform.

6.3 Landscape Plan

During the sand extraction and subsequent landfill operation and tree screen will continue to be planted along the southern boundary of the site. This will assist to minimise any potential visual or dust impacts. Planting of the tree screen is an ongoing action, with approximately 150 tree planted to date. A further 300 - 500 trees are proposed as part of this planting program, subject to pit extents and screening strategy.

The heathland vegetation present to the west of the pit will be retained during operations and post-excavation.

Once the landfill operations at the site have been completed pasture vegetation will be re-instated over the disturbed areas to reflect the pre-development land use. Topsoil from the stockpiles will be transferred to areas where landfill operations have reached maximum levels. The reinstatement of pasture vegetation will occurred in a staged manner to reflect the timing of completion of the landfill zones.

The optimum time of the year for spreading of pasture seed is early autumn. The Department of Agriculture and Food WA recommends a mixture of annual and perennial pastures with different growing habits and resistance to insects. Annual pastures are those which germinate at the break of the season. They grow, flower, set seed and then die off during late spring. Perennial pastures are those that

remain alive and green all years round such as couch, kikuyu, rhodes grass and palestine strawberry clover. Some pasture options are as follows:

- Annual legumes including subterranean clover varieties such as Dalkeith, Coolamon, Riverina, Gosse, Goulburn and Denmark
- Annual grasses including annual ryegrass
- Perennial legumes including palestine strawberry clover
- Perennial grasses including perennial ryegrass, phalaris, cocksfoot and tall fescue
- Sub-tropical grasses including rhodes grass

Advice will be sought from the WA Department of Agriculture and Food to assist with the final selection of the most appropriate pasture species for the site based on the climatic conditions, soil types and proposed stock usage.

6.4 Building and Infrastructure Removal

All existing site features related to the excavation works including buildings, storage tanks and access tracks will be removal will be undertaken once the landfill operations at the site have been completed. Until this time this infrastructure will continue to be used for management of the landfill operations.

6.5 Completion Criteria

The following completion criteria have been established for the finalisation of quarry and landfill operations at the site:

- The land surface is to be non-eroding and stable.
- Maximum slopes present onsite should be 1:0.5 grade, or as suitable for in situ material according to the Mines Safety and Inspection Regulations 1995.
- Cover of pasture species should be present which is capable of holding the soil and preventing wind erosion.
- No declared weeds as listed by the WA Department of Agriculture are to be present onsite.

7.0 REFERENCES

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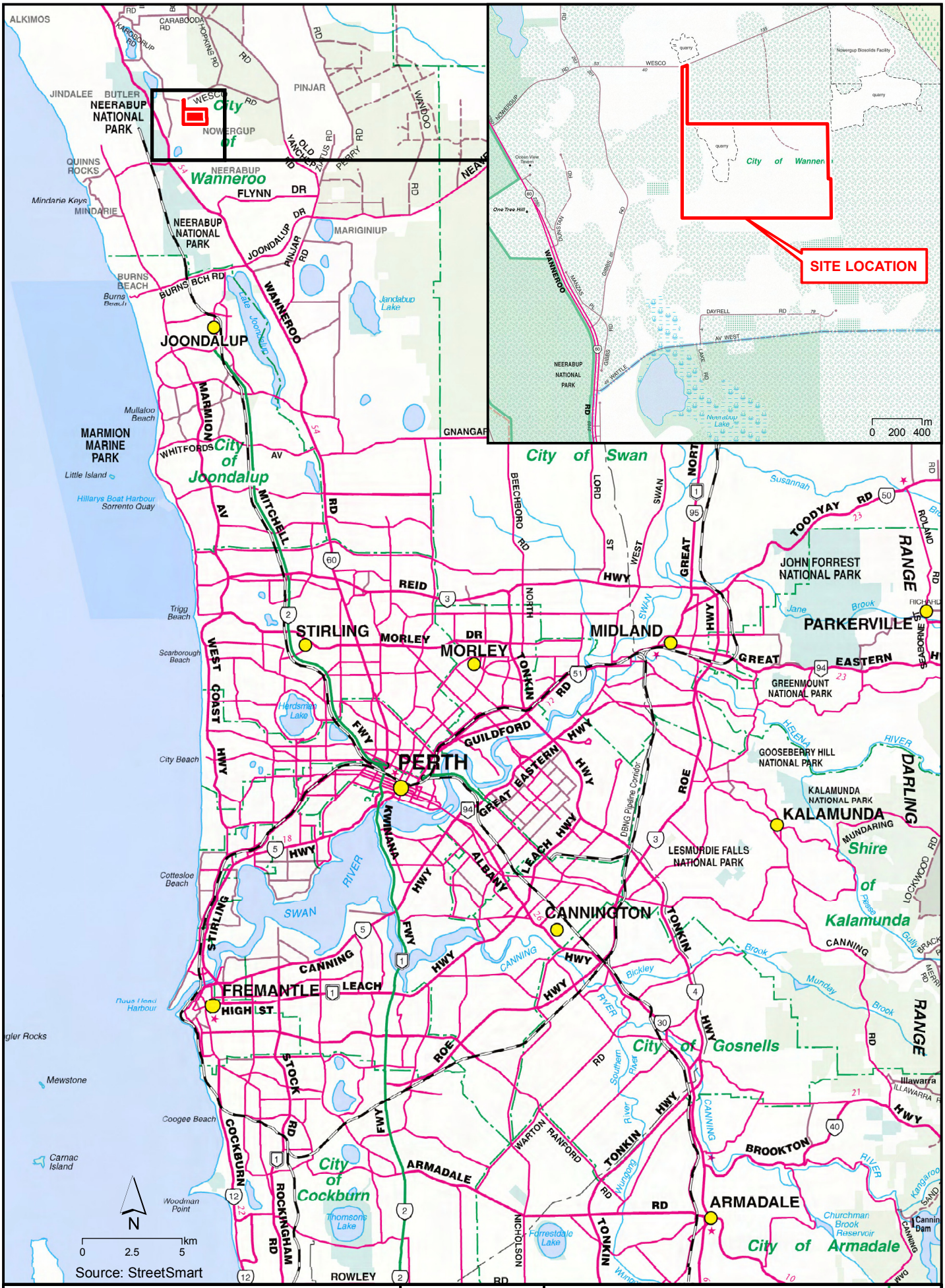
FIGURES



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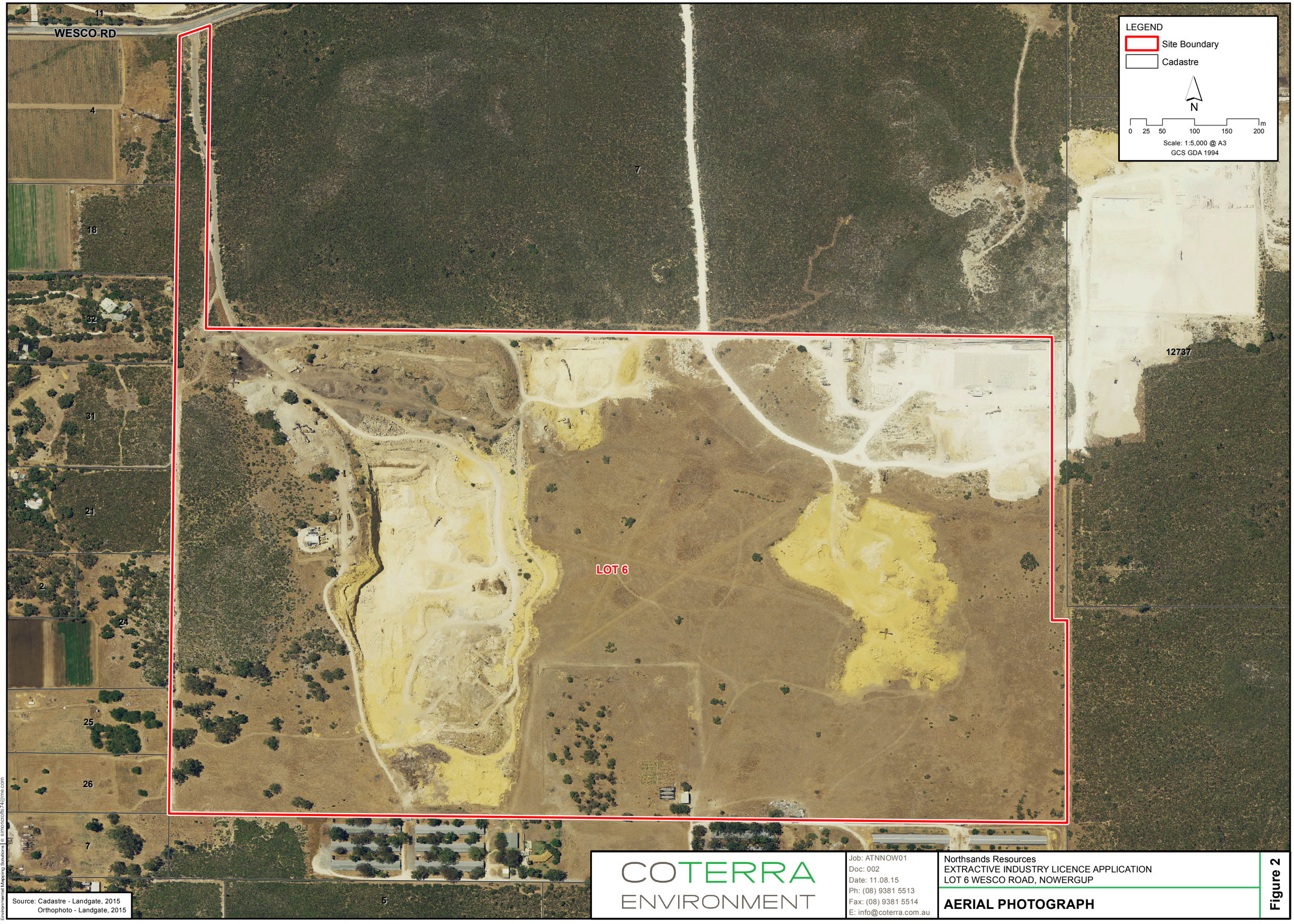
Northsands Resources
EXTRACTIVE INDUSTRY LICENCE APPLICATION
LOT 6 WESCO ROAD, NOWERGUP

SITE LOCATION

Figure 1



Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015

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AERIAL PHOTOGRAPH

Figure 2

SURVEY CONTROL POINTS

POINT ID	EASTING	NORTHING	ELEVATION	DESCRIPTION
PINW 9A	381312.239	6498599.869	56.772	STANDARD SURVEY MARK "PINJAR WEST 9A" - WESCO ROAD
9000	381531.323	6497779.327	59.698	PEG - TOP OF PIT PERIMETER
9003	381763.202	6497664.578	56.757	STAR IRON PICKET SET IN CONCRETE - TOP OF PIT PERIMETER

0 10 20 30 40 50 100 150 200 250

Source: Austin Surveys, October 2018

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SITE PLAN

Figure 3

Source: Austin Surveys, October 2018

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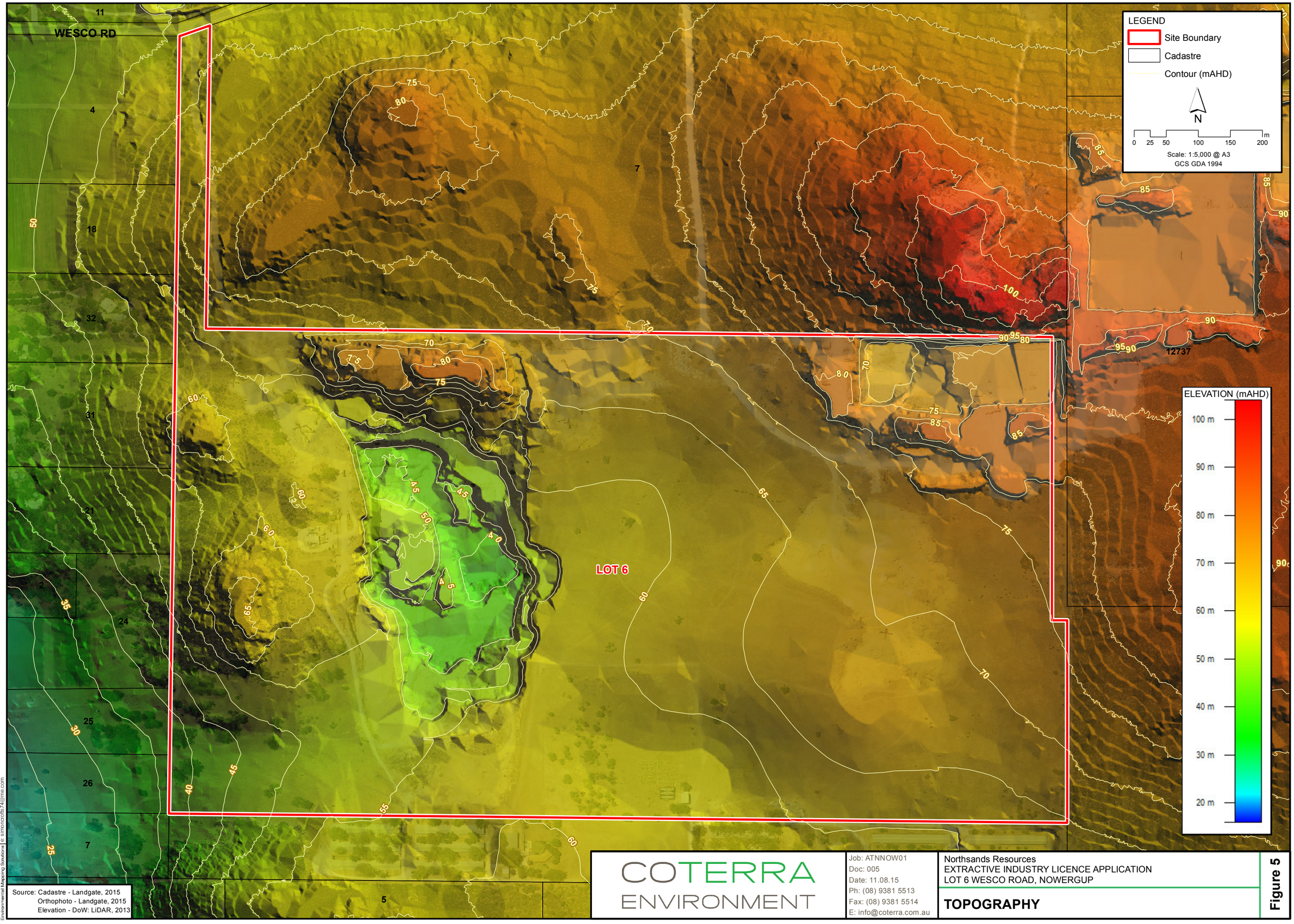
MAXIMUM EXTENTS PLAN

Figure 4



Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015
Elevation - DoW: LiDAR, 2013

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EXTRACTIVE INDUSTRY LICENCE APPLICATION
LOT 6 WESCO ROAD, NOWERGUP

TOPOGRAPHY

Figure 5

LEGEND

Site Boundary

Cadastre

ASS Risk Mapping

High to Moderate Risk

Geology

LS2: LIMESTONE - light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin, abundant karstic

LS1: LIMESTONE - light yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, a trace of feldspar, shell debris, variably lithified, surface kankar of eolian origin

Cps: PEATY CLAY - dark grey and black with variable sand content, of lacustrine origin

S7: SAND - pale and olive yellow, medium to coarse-grained, sub-angular quartz with a trace of feldspar, moderately sorted, of residual origin

N

0 50 100 200 300 400 m

Scale: 1:7,500 @ A3

GDA 1994 MGA Zone 50

WESCO RD

GIBBS RD

LOT 6

Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015
ASS - DER, 22.09.15
Geology, DoIR: Geological Survey of W.A., 1999

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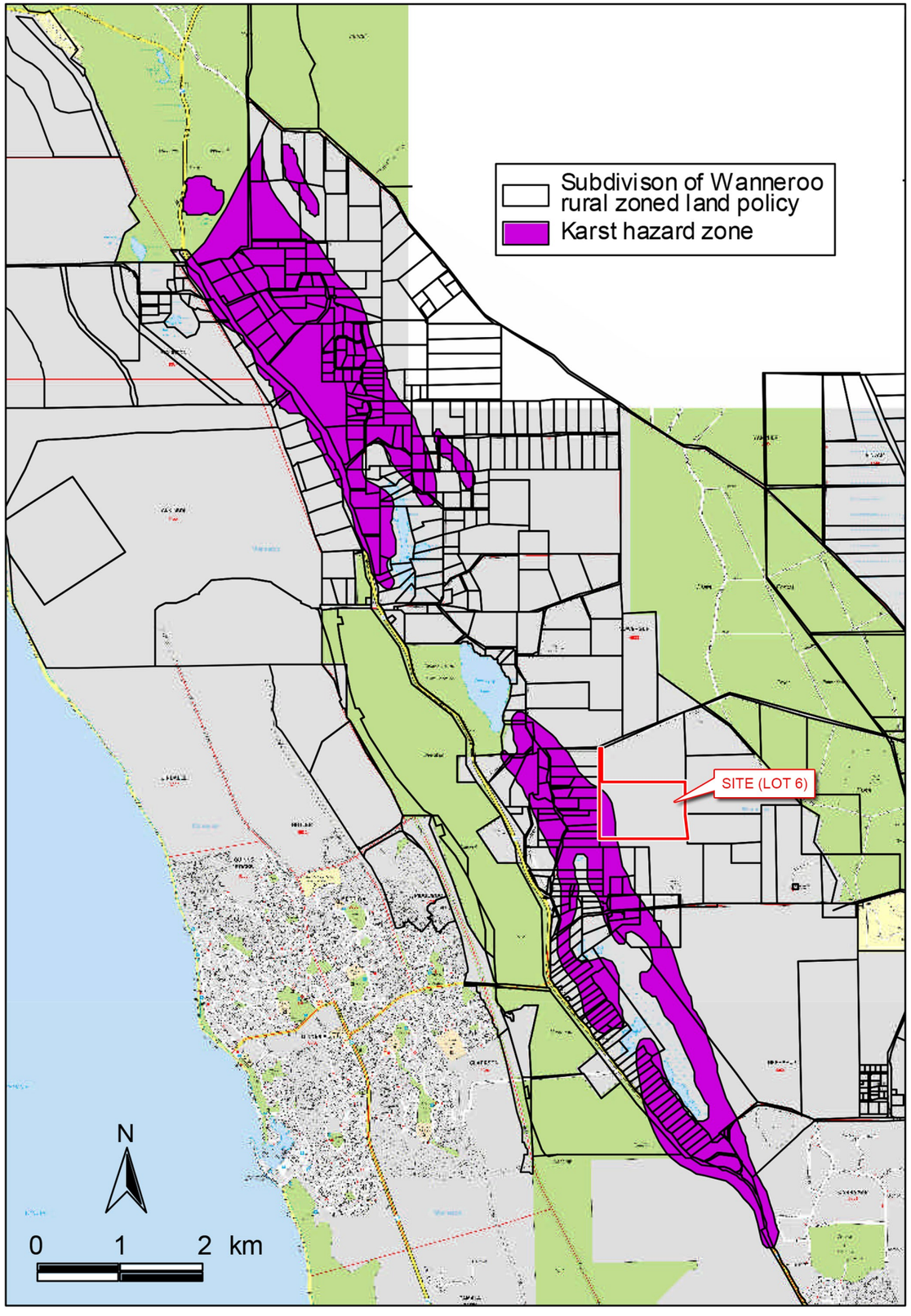
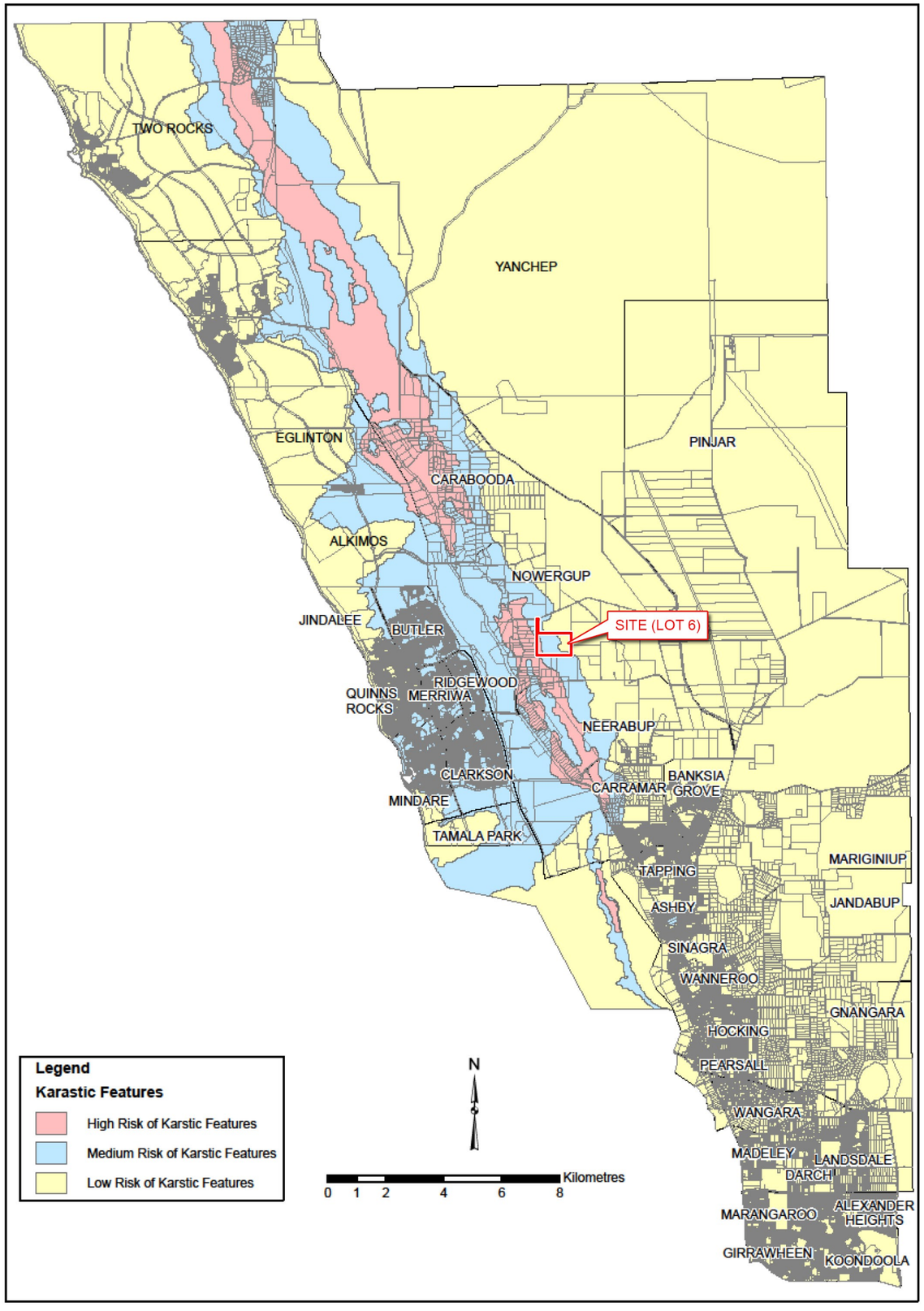
SOILS AND GEOLOGY

Figure 6





Source: Karst Mapping
City of Wanneroo 11.01.11 - DLI, 2007
Geoscience Australia - Daniella Csaky, Feb – June, 2003

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Northsands Resources
EXTRACTIVE INDUSTRY LICENCE APPLICATION
LOT 6 WESCO ROAD, NOWERGUP

KARST RISK MAPPING

Figure 7

LEGEND

Site Boundary

Cadastre

VEGTYPE

Cottesloe Complex-Central And\South

Herdsman Complex

N

0 50 100 200 300 400 m

Scale: 1:7,500 @ A3

GDA 1994 MGA Zone 50

WESCO RD

GIBBS RD

LOT 6

Cottesloe Complex-Central And\South

Herdsman Complex

11602 13 11 7 12738 12737 4 1 18 52 51 33 32 57 30 31 56 23 21 4 2 5 24 99 98 25 26 7 12 1524 5 22 2 10 8 4 23

Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015
Heddle Vegetation - DEC, 2002

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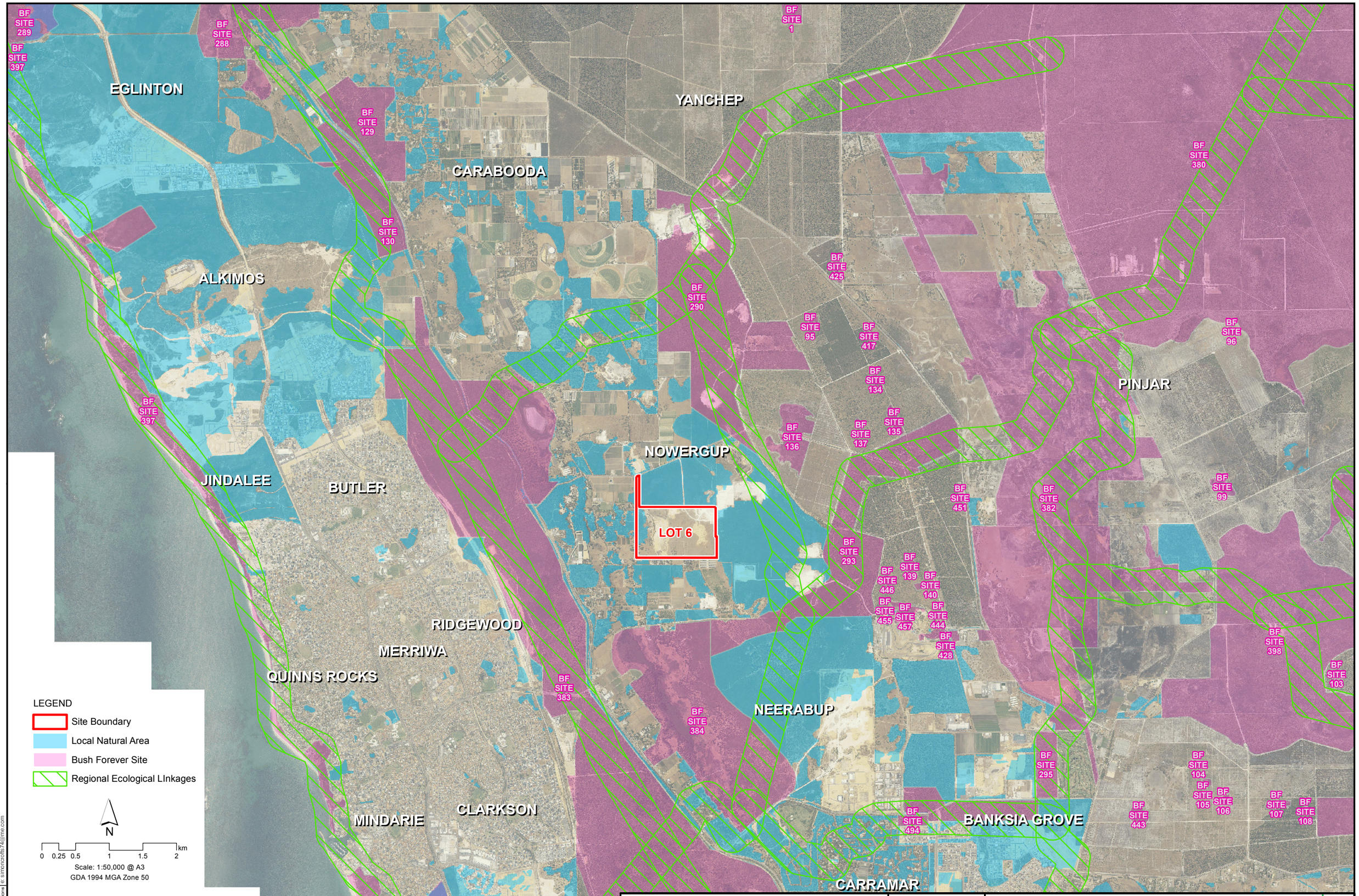
VEGETATION AND FLORA

Figure 8



Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015
Bush Forever - DOP, 2014
Ecological Linkages - Perth Biodiversity Project, 2003-2008
Local Natural Areas - WALGA, 2011

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EXTRACTIVE INDUSTRY LICENCE APPLICATION
LOT 6 WESCO ROAD, NOWERGUP

CONSERVATION AREAS

Figure 9

LEGEND

Site Boundary

Cadastre

Maximum Groundwater Contour (mAHD)

Wetlands

Conservation

Resource Enhancement

Multiple Use

N

0 50 100 200 300 400 m

Scale: 1:7,500 @ A3

GDA 1994 MGA Zone 50

WESCO RD

GIBBS RD

LOT 6

UFI 7938

UFI 8017

UFI 8018

UFI 8019

11602

12737

1524

Source: Cadastre - Landgate, 2015
Orthophoto - Landgate, 2015
Wetlands - DPaW, 04.06.15
Groundwater Contours - DoW, 2010

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Northsands Resources
EXTRACTIVE INDUSTRY LICENCE APPLICATION
LOT 6 WESCO ROAD, NOWERGUP

HYDROLOGY

Figure 10

APPENDIX A – DER Licence L7782/2002/6

Government of Western Australia
Department of Environment Regulation

Amendment Notice 1

Licence Number	L7782/2002/6
Licence Holder	Brodan (WA) Pty Ltd
ACN	130 026 274
Registered business address	18 Gibbs Road, NOWERGUP WA 6032
Date of amendment	Tuesday, 21 March 2017
Prescribed Premises	Category 13: crushing of building material; Category 62: Solid waste Depot; Category 63: Class I inert landfill site; Category 67(A): Compost manufacturing; and Category 12: Screening, etc. of material.
Premises	Northsands Resources Lot 6 on Diagram 34734, Wesco Road NOWERGUP WA 6032

Amendment

The Chief Executive Officer (CEO) of the Department of Environment Regulation (DER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* as set out in this Amendment Notice.

Date signed: 21 March 2017

Alan Kietzmann

MANAGER LICENSING (WASTE INDUSTRIES)

an officer delegated under section 20 of the Environmental Protection Act 1986 (WA)

Amendment Notice

This notice is issued under section 59 of the *Environmental Protection Act* 1986 (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B (9) of the EP Act.

Amendment Description

Brodan (WA) Pty Ltd (the Licensee) was granted a Licence on 26 April 2012 for the activities under the following prescribed premises categories:

- Category 13: Crushing of building material with a design capacity of 45,000 tonnes per year;
- Category 62: Solid waste Depot with a design capacity of 5000 tonnes per year;
- Category 63: Class I inert landfill site with a design capacity of 20,000 tonnes per year;
- Category 67(A): Compost manufacturing and soil blending with a design capacity of 60,000 tonnes per year; and
- Category 70: Screening, etc. of material with a design capacity of 60,000 tonnes per year

The Licensee accepts building and demolition waste materials (bricks, stones, concrete and associated plastics, timber, metal that can be recovered), inert wastes and solid wastes, including green wastes for mulching and Acid Sulfate Soils for neutralisation.

In November 2016, DER identified several administrative errors regarding the licence. This amendment is a DER initiated amendment to correct the errors, including:

- Replace category 70 with category 12 within the licence. Where the premises production or design capacity is 50,000 tonnes or more per annual period, the activity triggers prescribed category 12 under Schedule 1 of the *Environmental Protection Regulations 1987*.
- Correct the typographical error identified in condition 9(d) which incorrectly references 0.05%w/w instead of the industry standard of 0.001%w/w. The asbestos conditions are also updated with the inclusion of specific controls, rather than referencing guidelines or management plans.
- Inclusion of green waste and Acid Sulfate Soils in the acceptance criteria. The absence is an oversight as existing conditions have process controls directly relevant to these waste types.
- Remove condition Improvement condition 20, which required the Licensee to prepare, and implement an Asbestos Management Plan consistent with the DER Asbestos Guidelines. The required plan was submitted and determined to be consistent with the guideline. These commitments are reflected as licence conditions and do not change the environmental risk profile of the premises, nor increase the operation capacity. It also does not change the waste streams or waste management at the premises
- Amend condition 17(e) because it refers to incorrect conditions 19(a), (b) and (c). It should refer to conditions 17(a), (b) and (c).

DER also proposes to:

- Extend the licence duration of the licence to 2 May 2022. The premises has a development approval for a period of 25 years granted on 10 December 2003 under the provisions of the City of Wanneroo District Planning Scheme No 2 and the Metropolitan Region Scheme. The current licence is due to expire on 2 May 2017. Section 59(1)(k) of the *Environmental Protection Act 1986* allows for the CEO of the Department to extend the duration of a licence or works approval. The DER *Guidance Statement: Licence durations* allow for granting of licences up to a period of 20 years.

  In assessing the risk associated with extending the licence duration, the Delegated Officer reviewed:

  - The 2016 annual reporting, which identified non-compliances regarding provision of monitoring and sampling results (groundwater and Acid Sulfate Soils), and identified that the licensee exceeded the facility production capacity.
  - Levy inspections since 2014 have demonstrated compliance.
  - The last licence audit inspection conducted in 2014 identified several non-compliance matters, which were subsequently addressed. No complaints have been registered with DER relating to emissions from the premises.

  The licence duration does not change the risk profile of the premises.

Decision

The Delegated Officer has determined that the following administrative amendments be made to the licence to provide greater clarity of the Licensee requirements:

- Extend the duration of the licence, with consideration of approvals from planning authorities.
- Amend the category relating to the screening etc of material from 70 to 12 on the basis of the licence production capacity. The throughput is not amended.
- Amend condition 1(a) under waste acceptance and management to include acid sulphate soils (ASS) and green waste as these wastes are accepted on site. The premises has a dedicated area for ASS treatment and the licence allows to store green waste and burn green waste under specified conditions.
- Asbestos management conditions 9(a) –9(e) have been replaced with new regulatory controls in 9(a) and 9(b); this also addresses this issue on the incorrect asbestos limit in 9(d). The Delegated Officer has determined that the inclusion of the asbestos management conditions does not materially change the environmental risk profile of the premises. The specified conditions are derived from the Licensee commitments provided in compliance with condition 20 and the DER Asbestos Guidelines are appropriate to ensure adequate regulation of potential risk from asbestos waste or asbestos containing material (ACM) at the premises. Consequently, the relevant sections of the DER Asbestos Guidelines

have been included in Attachment 1 and 2.

- Improvement programme condition 20 is removed as it has been completed. The asbestos management conditions have been incorporated into the new condition 9(a) and 9(b).
- The typographical errors in condition 17(e) are corrected; the existing condition inaccurately references either non-existent or non-affiliated conditions.

The Delegated Officer has considered DER's *Guidance Statement: Regulatory Principles, Guidance Statement: Setting Conditions* and *Guidance Statement: Risk Assessment* in granting this amendment, and does not consider that this amendment will impact the risk profile of the premises, which is currently considered as low.

Amendment History

Instrument	Issued	Amendment
L7782/2002/6	26/04/2012	Licence issued
L7782/2002/6	25/01/2013	Licence amended to include improvement condition 20 (relating to asbestos management).
L7782/2002/6	21/3/2017	Amendment Notice 1: Amendment to replace category 70 with category 12. Amendment to Waste acceptance condition 1(a) to include acid sulphate soil (ASS) and green waste. Replace 9(a) - 9(e) asbestos management conditions with condition 9(a) and 9(b) and remove improvement condition 20. Correct referencing in condition 17(e). Extend licence expiry date.

Amendment

1. Prescribed premises categories on the front page of the licence are amended by deletion of the text shown in strikethrough and the insertion of the red text shown in underline in prescribed premises category Table below:

PRESCRIBED PREMISES CATEGORY

Schedule 1 of the Environmental Protection Regulations 1987

CATEGORY NUMBER	***CATEGORY DESCRIPTION***	***CATEGORY PRODUCTION OR DESIGN CAPACITY***	***PREMISES PRODUCTION OR DESIGN CAPACITY***
13	*Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned.*	*1000 tonnes or more per year*	*45,000 tonnes per year*
62	*Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or reuse.*	*500 tonnes or more per year*	*5000 tonnes per year*
63	*Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.*	*500 tonnes or more per year*	*20,000 tonnes per year*
67(A)	*Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.*	*1000 tonnes or more per year*	*60,000 tonnes per year*
~~*70*~~ *12*	~~*Screening, etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.*~~ *Screening, etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.*	~~*More than 5000 but less than 50 000 tonnes per year.*~~ *50,000 tonnes or more per year*	*60,000 tonnes per year*

2 The Licence has been amended with the deletion of the following conditions 9(a) to 9(e):

~~*9(a) The Licensee shall ensure that asbestos is managed in accordance with the document "Northsands Resources Asbestos Management Plan 2012"*~~

~~*9(b) The Licensee shall collect samples from processed material stockpiles and have them analysed for percentage weight by weight of fibres asbestos and asbestos fines; and asbestos containing material in accordance with:*~~

~~*(i) Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites Western Australia (DOH 2009); and*~~

~~*(ii) Contaminated Sites Management Series, Development of sampling and Analysis Programs (DEC 2001)*~~

~~*9(c) The licensee shall ensure that fibrous asbestos and asbestos fines does not exceed 0.001%w/w within processed material stockpiles.*~~

~~*9(d) The licensee shall ensure that asbestos-containing material does not exceed 0.05%w/w within the soils or stockpiles.*~~

~~*9(e) The licensee shall keep a record of all asbestos sampling results.*~~

3 The Licence has been amended with the insertion of the following condition 9(a) and 9(b):

ASBESTOS RISK MANAGEMENT

9(a) *The Licensee shall ensure that asbestos is managed according to the following:*

(i) Waste containing visible asbestos or asbestos containing material (ACM) shall not be accepted at the premises for crushing and screening purposes.

(ii) The licensee shall ensure that any waste that does not conform to the waste acceptance criteria in 9(a)(i) due to asbestos content, is covered or bagged and kept within a clearly identified, labelled, segregated and secure container prior to being removed off site to an appropriate authorised facility within 48 hours.

(iii) The Licensee must advise all source material providers that asbestos or potentially asbestos contaminated material is not accepted at the Premises.

(iv) The Licensee must include a "no asbestos" clause in all contracts with material sources.

(v) The Licensee must maintain a clearly visible sign saying "No Asbestos" at the entry to the Premises.

(vi) The licensee must visually inspect all loads of Waste when they arrive at the Gatehouse of the Premises, prior to unloading, to determine the risk of a load containing Asbestos or ACM and each load shall be classified in accordance with the risk classification procedure outlined in Attachment 1 (Classified Load).

(vii) Where the visual inspection identifies that a load contains asbestos or ACM, the licensee must:

i. reject the Waste for acceptance; and

ii. record the details of the Waste source, Waste carrier, registration number of the vehicle and the date of rejection; and

iii. maintain accurate and auditable records of all rejected loads on the Premises.

(viii) The licensee shall direct each accepted and Classified Load to an unloading area at the site for further inspection. The unloading area shall be appropriately designed and constructed to ensure the waste will not mix with other waste.

(ix) The licensee shall dampen all Classified Loads prior to unloading and maintain the waste in a damp state throughout the inspection process using appropriate dust suppression measures.

(x) The Licensee must continue to visually inspect waste on the Premises at all stages of the storage, sorting and screening process. Suspect asbestos identified at any stage of the process must be handled in accordance with the high risk load procedure outlined in section 3.4 of the DER Asbestos Guidelines, as per Attachment 2.

(xi) The licensee must maintain waste and processed waste on the Premises in at least two separate stockpile areas for unprocessed waste and processed waste tested for ACM and:

i. unprocessed waste and processed waste areas must be kept clearly separated at a minimum 3 m distance;

ii. processed waste tested for ACM and processed waste awaiting testing for ACM must be clearly separated by a minimum 3 m distance OR clearly delineated and separated with impermeable barriers; and

iii. clearly visible and legible signage must be erected on individual stockpiles to clearly identify and delineate tested processed waste, untested process waste and unprocessed waste.

(xii) The Licensee must ensure that suspected classified loads are classified as "high risk" and continue to be managed in accordance with the high risk procedure as outlined in section 3.4 of the DER Asbestos Guidelines (Attachment 1).

ASBESTOS PRODUCT TESTING AND SUPPLY

9(b) The Licensee shall ensure that asbestos product testing and supply is managed according to the following:

(i) The Licensee must ensure that testing of all finished products supplied for re-use must be undertaken in accordance with the product testing procedures as outlined in section 4.3 of the DER Asbestos Guidelines (Attachment 2).

(ii) The Licensee must ensure that finished products supplied for re-use are only supplied to customers from stockpiles that have been sampled and tested in accordance with section 4.3 of the DER Asbestos Guidelines (Attachment 2) and shown to conform to the product specification of 0.001% asbestos weight for weight (w/w) for asbestos content (in any form) within any recycled products.

(iii) The Licensee must retain all testing records for at least 2 years and make them available to customers on request.

4 The Licence has been amended by the deletion of condition 20 and Table 1.

~~*20 The Licensee shall complete the improvements in Table 1 by the date specified.*~~

~~***Table 1: Improvement Programme***~~		
~~***Improvement reference***~~	~~***Improvement***~~	~~***Date of completion***~~
~~*IR1*~~	~~*The Licensee shall prepare and submit to the Director an Assessment Report that assesses the compliance of the Premises operations with the DEC Asbestos Guidelines.*~~	~~*Within 21 days of issue of licence amendment*~~
~~*IR2*~~	~~*The Licensee shall, where the Assessment Report required by IR1 identifies that the Premises operations are not in compliance with the DEC Asbestos Guidelines, submit an Environmental Improvement Plan (EIP) to the Director for approval. This EIP shall as a minimum:*~~ ~~*(a) Identify the aspects of the Premises operations that do not comply with the DEC Asbestos Guidelines;*~~ ~~*(b) Include details of the measures that will be implemented at the Premises to achieve compliance with the DEC Asbestos Guidelines; and*~~ ~~*(c) Include an action plan with time frames for implementing the measures detailed*~~	~~*Within 42 days of issue of the licence amendment*~~

	~~*in (b).*~~	
~~*IR3*~~	~~*The Licensee shall comply with the DEC Asbestos Guidelines.*~~	~~*In accordance with the EIP approved in IR2.*~~ ~~*Where no EIP is required by IR2 the Licensee shall comply with the Asbestos Guidelines from the date of approval of the Assessment Report required by IR1.*~~

5 The Licence duration is extended to 2 May 2022.

6 Condition 17(e) amended by the deletion of the text shown in strikethrough below and the insertion of the red text shown in underline below:

17(e) The Licensee shall ensure that the recorded results of the sampling and analysis referred to in conditions ~~19~~ 17(a), (b) and (c) are provided to the ~~Director~~ CEO in accordance with condition ~~6~~ 18(a).

7 The Licence is amended by the insertion of Attachment 1 and 2.

Attachment 1: Section 3.4 of the DER Asbestos Guidelines (page 11 and page 12)

- The content/waste types within the load; and
- The type of load.

Where the source of the load can clearly be determined to be a building or structure constructed after 1990 then the load can be considered to represent a low risk of asbestos contamination and managed as outlined in the following section. Where the waste originates from a building constructed before 1990 or there is uncertainty over this issue, the risks associated with asbestos in the load must be established in line with the Risk Classification Matrix below.

Once classified, each load must be directed to the appropriate area for unloading and further inspection in line with the following sections.

Risk Classification Matrix			
	Type of load		
Material Type	**Commercial**	**Public, utes, cars and trailers***	**Skip bins**
Clean Concrete (without formwork)	Low	High	High
Clean Brick	Low	High	High
Clean Bitumen / Asphalt	Low	High	High
Mixed Construction waste	High	High	High
Mixed Demolition waste	High	High	High

* if it is possible to view the entire load of incoming C & D material (eg a small trailer with a shallow load, then consideration may be given to classifying these loads as low risk

(Risk Matrix Classification *adapted from WorkSafe Victoria 2006 and WMAA 2009*)

3.4 Load inspection after acceptance

Each accepted and classified load shall be directed to an unloading area at the site which is appropriately designed and constructed to ensure the waste will not mix with other waste. Where feasible, separate unloading areas shall be provided for low risk and high risk wastes.

All loads shall be dampened prior to unloading and maintained in a dampened state throughout the inspection process. Operators will need to ensure there are adequate facilities on the premises to achieve this.

Low risk load procedure

Loads classified as "low risk", must be visually inspected while the material is being unloaded to determine whether any asbestos can be identified.

If suspect fibrous asbestos (FA) or asbestos fines/fibres (AF) are detected, the load must be isolated, kept wet and once appropriately contained in accordance with the Asbestos Factsheet in Appendix A, redirected to an appropriately authorised disposal facility. If suspect ACM is identified, the load must be reclassified as "high risk" and continue to be processed in accordance with the high risk procedure below. Where the visual inspection confirms that the

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load is clear of suspect ACM, FA and AF, the load may then be added to the waste stockpiles awaiting further processing eg crushing and screening.

High risk load procedure

Loads classified as "high risk" must be unloaded and spread over a sufficiently large area to enable a comprehensive visual inspection of all sides of the material to be undertaken. One method of achieving this is to spread the material to a depth of less than 30cm and to turn over the material with the use of an excavator or similar. Where appropriate, larger sections of concrete should be inverted to permit a visual check for embedded or underlying asbestos product debris.

If suspect FA or AF are detected, the load must be isolated, kept wet and once appropriately contained in accordance with the Asbestos Factsheet in Appendix A, and redirected to an appropriately authorised disposal facility.

Where suspect ACM is identified within a load and is not capable of being easily removed by hand, the load must be rejected and should be isolated, kept wet and once appropriately contained in accordance with the Asbestos Factsheet in Appendix A, and redirected to an appropriately authorised disposal facility.

Where suspected ACM fragments capable of being easily removed by hand are identified in a load, the suspect ACM must be removed from the load and either:

1. Appropriately isolated and covered for asbestos testing. If testing of representative samples confirms the material is ACM it must be redirected to an appropriately authorised disposal facility. If testing confirms the material is not ACM the waste can be added to the stockpile awaiting further processing; or

2. Assumed to be ACM and redirected to an appropriately authorised disposal facility.

All suspected or assumed ACM must be segregated. Material must be clearly labelled, kept secure and sufficiently contained to prevent the release of asbestos including wind blown fibres.

Once all suspected or assumed ACM has been removed from a load in line with the above procedure the residual waste can be added to the stockpile awaiting further processing.

Records must be kept to ensure that the process from receipt of C&D material to the completion of the unloading procedure is auditable and that any loads found to contain suspect asbestos can be traced back to the customer and originating site. Through Part V licence conditions, DEC will require records of loads found to contain asbestos and action taken by the C&D recycler to address this issue with the customer, to be submitted on a regular basis. DEC will take follow up action with customers delivering asbestos containing waste to the premises as necessary.

Attachment 2: Section 4.3 of the DER Asbestos Guidelines (pages 15 - 20)

4 Monitoring and Testing

Monitoring must be undertaken to confirm that risk management measures are effectively meeting their objectives. This shall include qualitative and quantitative monitoring and product testing.

4.1 Qualitative monitoring

Site operatives must undertake visual inspections whilst the facility is operational to ensure that fugitive emissions of dust are being adequately controlled and are not being carried outside of the premises. Where fugitive dust releases are identified their source must be investigated and all reasonable and practicable measures implemented to prevent or minimise the release.

Where risk management measures are ineffective or likely to be ineffective at preventing visible dust crossing the site boundary, for example during adverse weather conditions, waste processing activities must cease until additional measures have been put in place to prevent the discharge or until the adverse weather conditions have passed.

4.2 Quantitative environmental monitoring

On some sites it may be necessary for ambient dust or asbestos fibre air monitoring to be undertaken to provide further confidence in risk management measures. Such monitoring may be required where recycling sites are located in close proximity to sensitive receptors, are within a relevant Environmental Protection Policy area or have a poor compliance history relating to fugitive dust control. Where quantitative dust monitoring is not proposed, the proponent/operator must provide a risk based justification as to why it is not considered necessary at their premises.

Dust monitoring provides a useful surrogate measure to evaluate the potential generation and distribution of airborne dust and asbestos fibres and will normally be sufficient on most sites. Dust monitoring equipment must demonstrate that dust levels are kept as low as reasonably possible. Tapered Element Oscillating Microbalance (TEOM) (or equivalent) equipment is preferred to provide continuous and accurate perimeter air monitoring for community protection. Any site perimeter monitoring for this purpose should be conducted to ensure compliance with the National Environmental Protection Measure (NEPM) ambient air 24 hour PM_{10} goal of 50 ug/m^3.

Where air quality monitoring is required, an air quality monitoring and reporting strategy must be developed by a person suitably experienced in dust/asbestos sampling and exposure assessment and any associated analysis be undertaken by a laboratory accredited by NATA for this purpose.

4.3 Product testing and supply

To ensure that recycled products have been produced to the required specification in relation to asbestos content it is necessary for product testing to be undertaken. The testing procedures detailed in this section have application for the three main recycled products:

1. Recycled drainage rock 20-27mm;

2. Recycled sand, screened to <10mm; and
3. Recycled road-base, <19mm.

The testing must be documented as outlined under Section 5.3.

Product specification

To ensure the health of those using or coming into contact with recycled C&D products is protected, the asbestos content (in any form) of any recycled products must not exceed 0.001% asbestos weight for weight (w/w).

Inspection and sampling requirements

All types of recycled product must be inspected and/or sampled and tested for ACM, FA and AF, as outlined below. Inspections and sampling may be undertaken by staff employed by the licensee as long as they have received the required asbestos training for operational staff set out in section 5.2.

ACM and FA are subject to visual inspection and sampling procedures since they are larger in size (>7mm) and AF (<7mm) is assessed by submitting samples for laboratory analysis.

Recycled products may be sampled from conveyors or stockpiles. Whichever approach is adopted, the operator will need to ensure that they have appropriate systems in place to allow them to identify where in the product stockpiles each sample is from to allow further testing or separation to occur if required.

Stockpile inspection and sampling

In the case of recycled drainage rock and recycled road-base a visual inspection should be undertaken in a systematic grid fashion over the any new stockpile material to identify any suspect asbestos material.

No sampling is required for recycled drainage rock, other than to determine by laboratory analysis if necessary whether a suspect fragment is asbestos.

For recycled road-base and screened sand, sampling is necessary and must be spread evenly over the whole stockpile surface or samples may be taken at regular intervals (as per conveyor sampling) during construction of the stockpile. Suspect asbestos material or areas must be targeted for sampling.

Sampling of road base and screened sand products must occur at a minimum rate of 40 locations per 4000 tonnes or 14 samples per 1000m^3 of product.

Conveyor sampling

Sampling of road base and screened sand products must occur at a minimum rate of 1 sample per 70m^3 of a product output. Suspect asbestos material or areas must be targeted for sampling.

Government of **Western Australia**
Department of **Environment and Conservation**

LICENCE FOR PRESCRIBED PREMISES
Environmental Protection Act 1986

LICENCE NUMBER: L7782/2002/6 **FILE NUMBER: DEC7348**

LICENSEE
Brodan (WA) Pty Ltd
18 Gibbs Road
NOWERGUP WA 6032
ACN: 130 026 274

PREMISES
Northsands Resources
Lot 6 on Diagram 34734, Wesco Road
NOWERGUP WA 6032
(As depicted in Attachment 1)

PRESCRIBED PREMISES CATEGORY
Schedule 1 of the Environmental Protection Regulations 1987

CATEGORY NUMBER	CATEGORY DESCRIPTION	CATEGORY PRODUCTION OR DESIGN CAPACITY	PREMISES PRODUCTION OR DESIGN CAPACITY
13	Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned.	1000 tonnes or more per year	45,000 tonnes per year
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or reuse.	500 tonnes or more per year	5000 tonnes per year
63	Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	500 tonnes or more per year	20,000 tonnes per year
67(A)	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	1000 tonnes or more per year	60,000 tonnes per year
70	Screening, etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	More than 5000 but less than 50 000 tonnes per year.	60,000 tonnes per year

CONDITIONS OF LICENCE
Subject to the conditions of licence set out in the attached pages.

Officer delegated under Section 20
of the *Environmental Protection Act 1986*

ISSUE DATE: Thursday, 26 April 2012
COMMENCEMENT DATE: Thursday, 3 May 2012
EXPIRY DATE: Tuesday, 2 May 2017
AMENDMENT DATE: Friday, 25 January 2013

DEFINITIONS

"Acid Sulphate Soils Management Plan" means the report titled "Acid Sulphate Soil Management Plan, November 2011 authored by Faron Mengler" provided to the Department of Environment and Conservation in relation to the management plan;

'clean fill' means as defined in the Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009);

'contaminant concentrations less than Class I landfill acceptance criteria' means that the concentrations of the contaminants in the material is less than the concentration listed in either Table 4 or Table 5 of the Landfill Waste Classification and Waste Definitions 1996 (as amended)

'cover material' means subsoil or other approved inert waste used for covering of waste;

'Type 1 – Inert Waste' means:

(a) non-hazardous, non-biodegradable (half-life greater than 2 years) wastes containing contaminant concentrations less than Class I landfill acceptance criteria but excluding paper, cardboard and materials that require special treatment to render them inert (e.g. sulfidic peat, acid sulfate soils);

(b) includes materials specified under the heading 'Examples of Type 1 inert wastes' in Table 1, of the Landfill Waste Classification and Waste Definitions 1996 (as amended December 2009)

"DEC Asbestos Guidelines" means the current version of the Guidelines for managing asbestos at construction and demolition waste recycling facilities;

'Director' means Director, Environmental Regulation Division of the Department of Environment and Conservation for and on behalf of the Director General as delegated under Section 20 of the *Environmental Protection Act 1986*;

'Director' or 'Department of Environment and Conservation' for the purpose of correspondence means-

Regional Leader, Industry Regulation
Swan Region
Department of Environment and Conservation
Locked Bag 104, Bentley DC WA 6983 Telephone: (08) 9333 7510
BENTLEY DC WA 6983 Facsimile: (08) 9333 7550

'greenwaste' means waste that originates from trees or plants;

'licensed' means licensed under the *Environmental Protection Act 1986* unless otherwise specified.

'Landfill Waste Classification and Waste Definitions' 1996 (as amended)', refers to the document issued by the Director General of the Department of Environment, dated 17 December 2009;

'mm' means millimetre;

'mg/L' means milligrams per litre;

'NATA' means National Association of Testing Authorities; and

"Premises" means the area depicted in Attachment 2.

'putrescible' means the component of the waste stream likely to become putrid. e.g. greenwaste.

GENERAL CONDITIONS

WASTE ACCEPTANCE AND MANAGEMENT

1(a) The licensee shall accept the following type of waste at the premises:
- (i) type 1 inert waste.

1(b) The licensee shall bury only inert building material.

1(c) The licensee shall take the following measures when landfilling activities are conducted at the premises:
- (i) dispose of waste on the premises at least 25 metres from the premises boundary;
- (ii) place waste within a defined trench or within an area enclosed by earthen or other bunds;
- (iii) restrict the landfill tipping face area to a maximum linear length of 50 metres;
- (iv) ensure that waste is deposited and compacted in layers (benches) not exceeding a vertical height of 2 metres;
- (v) that each completed layer shall be topped with at least 100mm of sand or limestone aggregate to maintain a trafficable surface; and
- (vi) cover waste with a final soil cover of at least one metre.

WINDBLOWN WASTE

2(a) The licensee shall ensure that where deposited waste material has the potential to become wind blown or cause dust to cross the boundary of the premises, a minimum of 100 mm of clean cover material free from any potential dust nuisance, shall be placed on the waste daily.

2(b) The licensee shall stockpile sufficient cover material to allow waste to be covered in accordance with Condition 2(a) of this licence and to cover waste in the event of a fire.

2(c) The licensee shall ensure that all wind blown waste is contained within the boundaries of the premises.

WASTE INVENTORY

3 The licensee shall ensure all waste is quantified and categorised prior to disposal according to the National Waste Classification System. This information shall be recorded and kept at the premises and shall be made available to an Inspector on request.

FENCING

4(a) The licensee shall erect and maintain a fence at least 1.8 meters high around the whole of the boundary of the active landfill area, except where there is a lockable gate. The licensee shall ensure that any entrance to the premises is securely locked when the premises is unattended.

4(b) The licensee shall install and maintain a sign at the entrance to the premises which clearly displays the following:
- (i) hours of operation (if applicable);
- (ii) contact telephone number for information and complaints or notification of fires;
- (iii) where applicable, a list of materials acceptable for recycling and the location of where they can be deposited on the premises;
- (iv) the types of waste that must not be deposited on the premises and a contact telephone number for alternative disposal options; and
- (v) a warning, indicating penalties for people lighting fires.

BUFFER DISTANCES

5 The licensee shall establish and maintain an internal buffer distance of 35 metres between the boundary of the premises and any operations conducted on the premises.

COMPLAINTS

6 The licensee shall keep a written record of all complaints received at the premises concerning the environmental impact of the premises. The record must be dated and provide the following (if known):

(i) name and address of complainant(s);
(ii) date and time of complaint;
(iii) location about which the complaint was made;
(iv) general description of the nature of complaint;
(v) wind direction, wind speed and temperature at the time of the complaint;
(vi) likely source of the reported problem; and
(vii) action taken in response to the complaint.

GREENWASTE STORAGE

7(a) The licensee shall ensure that the total amount of greenwaste stored at the premises is not wider than 8 metres, not longer than 60 metres and not higher than 4.5 metres.

7(b) The licensee shall ensure that all mulched greenwaste is stored in windrows that are no larger than 8 metres wide, 60 metres long and 3.5 metres high.

7(c) The licensee shall ensure that each mulched greenwaste windrow is aerated on a monthly basis.

ACID SULFATE SOIL MANAGEMENT

8(a) The licensee shall ensure that acid sulfate soil material accepted onsite is stored and processed according to the *"Acid Sulfate Soil Management Plan"* (see definitions).

8(b) The licensee shall ensure that all acid sulfate soil materials are stored and processed on a hardstand of compacted limestone no less than 300mm in thickness.

8(c) The licensee shall ensure that the base of the hardstand referred to in condition 10(b) is surrounded by an impermeable bund and that all water from the base of the hardstand drains into a lined retention basin.

8(d) The licensee shall not bury any form of acid sulfate soil at the premises.

8(e) The licensee shall only blend un-neutralised acid sulfate soil with crushed limestone in area A as per Attachment 1. No other soil blending activities shall be undertaken at the site.

8(f) The licensee shall ensure that when acid sulfate soil is used for rehabilitation at the premises the following measures are taken:

(i) ensure the acid sulfate soil materials are neutralised as per the Department of Environment and Conservation guidelines *"Acid Sulfate Soil Guideline Series – Treatment and management of soils and water in acid sulfate soil landscapes"* (July 2011).
(ii) ensure the acid sulfate soil is not the main ingredient in the materials used for final cover and rehabilitation; and
(iii) the acid sulfate soil must not be applied to a depth greater than 2 metres.

ASBESTOS MANAGEMENT

9(a) The licensee shall ensure that asbestos is managed in accordance with the document "Northsands Resources Asbestos Management Plan 2012".

9(b) The licensee shall collect samples from processed material stockpiles and have them analysed for percentage weight by weight of fibrous asbestos and asbestos fines; and asbestos- containing material in accordance with:

(i) Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites Western Australia (DOH 2009); and
(ii) Contaminated Sites Management Series, Development of Sampling and Analysis Programs (DEC 2001).

9(c) The licensee shall ensure that fibrous asbestos and asbestos fines does not exceed 0.001% w/w within processed material stockpiles.

9(d) The licensee shall ensure that asbestos-containing material does not exceed 0.05%w/w within the soils or stockpiles.

9(e) The licensee shall keep a record of all asbestos sampling results.

AIR POLLUTION CONTROL CONDITIONS

DUST – GENERAL REQUIREMENT

10(a) The licensee shall take measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities, crushing and screening of bulk materials to ensure visible dust does not cross the premises boundary.

10(b) The licensee shall pave, seal or otherwise treat all trafficked areas, and maintain them in a manner which minimises airborne dust generation.

10(c) The licensee shall employ routine maintenance and housekeeping practices to ensure that there is no accumulation of waste materials in or around the site which may lead to the generation of airborne dust.

ODOUR MANAGEMENT

11 The licensee shall ensure that odour emitted from the premises does not unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person at a sensitive receptor.

BURNING OF WASTE

12(a) The licensee shall not burn any non-green waste at the premises.

12(b) If greenwaste is burnt on site, the licensee shall;

(i) ensure the greenwaste is dry and seasoned for at least two months before burning;
(ii) ensure the greenwaste is burnt in a dedicated area at least 25 metres from any premises boundary or active fill area;
(iii) provide an adequate water supply and distribution system to prevent fires from escaping beyond the greenwaste area;
(iv) burn greenwaste in a manner to minimise the generation of smoke;
(v) burn greenwaste in windrows or trenches;

(vi) restrict the volume of greenwaste burnt such that it is completely burnt during daylight hours;
(vii) attend the fire until it is extinguished; and
(viii) advise the Director by facsimile at least 24 hours prior to burning commencing.

WATER POLLUTION CONTROL CONDITIONS

LEACHATE CONTROL

13(a) The licensee shall ensure that all organic material is stored and processed on an approved hardstand area no less than 300mm in thickness.

13(b) The licensee shall ensure that all run-off from the organic material referred to in condition 13(a) drains into, and is contained within a lined retention basin.

13(c) The licensee shall ensure that uncontaminated stormwater is diverted away from organic storage and blending areas on the site.

STORMWATER MANAGEMENT

14 The licensee shall direct storm water run-off, such as water from roofs and site drainage, away from the soil blending area.

PROTECTION OF GROUND AND SURFACE WATERS

15(a) The licensee shall maintain an undisturbed separation distance of at least 3 metres between the base of the current and future waste disposal areas and the highest level of the groundwater.

15(b) The licensee shall ensure that the earth within the 3 metre separation distance referred to in condition 17(a) is undisturbed.

15(c) The licensee shall maintain a minimum distance of at least 100 metres between the operations conducted on the premises and any superficial water body.

LIQUID CHEMICAL STORAGE

16(a) The licensee shall store environmentally hazardous chemicals including, but not limited to, fuel, oil or other hydrocarbons (where the total volume of each substance stored on the premises exceeds 250 litres) within low permeability (10^{-9} metres per second or less) compound(s) designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound.

16(b) The licensee shall ensure that the compound(s) described in part (a) to this condition shall:

(i) be graded or include a sump to allow recovery of liquid;
(ii) be chemically resistant to the substances stored;
(iii) include valves, pumps and meters associated with transfer operations wherever practical. Otherwise the equipment shall be adequately protected (e.g. bollards) and contained in an area designed to permit recovery of chemicals released following accidents or vandalism;
(iv) be controlled such that the capacity of the bund is maintained at all times (e.g. regular inspection and pumping of trapped uncontaminated rain water).

16(c) The licensee shall immediately remove and dispose of any liquid resulting from spills or leaks of chemicals including fuel, oil or other hydrocarbons, whether inside or outside the low permeability compound(s).

MONITORING CONDITIONS

GROUNDWATER MONITORING PROGRAMME AND REPORTING

17(a) The licensee shall, at the frequencies stated, take and have analysed, representative water samples from the following monitoring sites:

Monitoring Sites	Sampling Frequency	Parameters to be measured
Bores: 1, 2 and 3 (refer to Attachment 1)	biannually (June and December)	Arsenic, Aluminium, Cadmium, Chromium, Copper, Iron, Mercury, Manganese, Nickel, Lead, Sulphate, Zinc, Total Ammonia, Total Nitrogen, Total Phosphorus, Potassium, chloride, Bicarbonate, Carbonate, pH, Total Dissolved Solids, Electrical Conductivity, Standing Water Level (SWL)*

SWL shall be determined prior to collection of other water samples.
Note: With the exception of pH, conductivity and SWL, all measurements are to be reported in mg/L.

17(b) The licensee shall ensure that all water samples are collected in accordance with Part 1 of Australian Standard AS/NZS 5667.

17(c) The licensee shall ensure that all water samples are submitted to a laboratory with current NATA accreditation for the specified analysis, and analysed in accordance with the current "Standard Methods of the Examination of Water and Wastewater-APHA-AWWA-WEF".

17(d) The licensee shall advise the Director within 7 days, if any of the monitoring bores listed in part (a) of this condition are de-commissioned or rendered unusable.

17(e) The licensee shall ensure that the recorded results of the sampling and analysis referred to in conditions 19(a), (b) and (c) are provided to the Director in accordance with condition 6. .

REPORTING CONDITIONS

ANNUAL ENVIRONMENTAL REPORT

18(a) The licensee shall submit to the Director, by 31 May each year, an Annual Environmental Report containing the monitoring data required by any condition of this licence obtained during the monitoring period from 28 April to 27 April.

18(b) The report shall include, but not be limited to, an assessment of the data against any limits set in this licence or other environmental guidelines or policies and data from previous years' monitoring. It shall identify any data exceeding those limits, guidelines or policies and provide information on why the exceedence occurred (if known) and action taken by the licensee to prevent recurrence of such exceedances.

18(c) In the Annual Report, the licensee shall provide details of:
- (i) measures taken to control pests and vermin;
- (ii) number and severity of any fires on site;
- (iii) measures taken to suppress dust;

(iv) measures taken to control wind-blown waste;
(v) average compaction rates;
(vi) any changes to site boundaries.

18(d) In the Annual Environmental Report the licensee shall provide details of the monitoring programme stated in the Acid Sulphate Soils Management Plan (see definitions).

19 ANNUAL AUDIT COMPLIANCE REPORT
The licensee shall by **31 May** in each year, provide to the Director an Annual Audit Compliance Report in the form in Attachment 2 to this licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the licensee has complied with the conditions of this licence, and any previous licence issued under Part V of the Act for the premises, during the period beginning **28 April** the previous year and ending on **27 April** in that year.

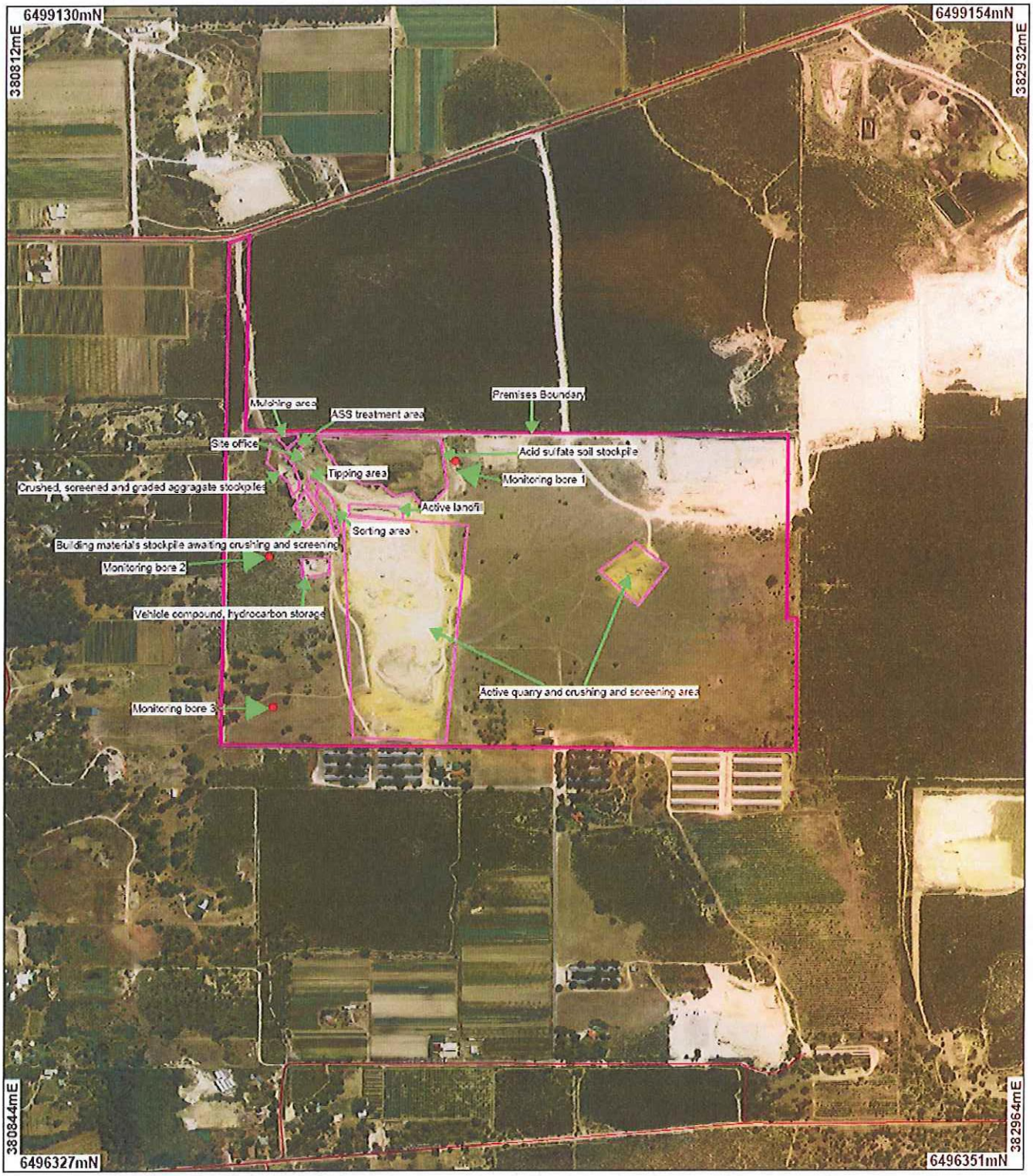
IMPROVEMENT PROGRAMME

20 The Licensee shall complete the improvements in Table 1 by the date specified.

Table 1: Improvement Programme

Improvement reference	Improvement	Date of completion
IR1	The Licensee shall prepare and submit to the Director an Assessment Report that assesses the compliance of the Premises operations with the DEC Asbestos Guidelines.	Within 21 days of issue of licence amendment
IR2	The Licensee shall, where the Assessment Report required by IR1 identifies that the Premises operations are not in compliance with the DEC Asbestos Guidelines, submit an Environmental Improvement Plan (EIP) to the Director for approval. This EIP shall as a minimum: (a) Identify the aspects of the Premises operations that do not comply with the DEC Asbestos Guidelines; (b) Include details of the measures that will be implemented at the Premises to achieve compliance with the DEC Asbestos Guidelines; and (c) Include an action plan with time frames for implementing the measures detailed in (b).	Within 42 days of issue of the licence amendment
IR3	The Licensee shall comply with the DEC Asbestos Guidelines.	In accordance with the EIP approved in IR2. Where no EIP is required by IR2 the Licensee shall comply with the Asbestos Guidelines from the date of approval of the Assessment Report required by IR1.

Plan of Premises



Attachment 2

ANNUAL AUDIT COMPLIANCE REPORT

SECTION A
LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name: Trading as:	ABN:
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of licence complied with within the reporting period? (please tick the appropriate box)

Yes □ Please proceed to Section C
No □ Please proceed to Section B

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL:_____

Attachment 2

LICENCE NUMBER: L7782/2002/6 **FILE NUMBER:** DEC7348

SECTION B - DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each licence condition that was not complied with.

a) Licence condition not complied with?	
b) Date(s) when the non compliance occurred, if applicable?	
c) Was this non compliance reported to DEC?	
☐ Yes ☐ Reported to DEC verbally Date _____ ☐ Reported to DEC in writing Date _____	☐ No
d) Has DEC taken, or finalised any action in relation to the non compliance?	
e) Summary of particulars of non compliance, and what was the environmental impact?	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)	
g) Cause of non compliance	
h) Action taken or that will be taken to mitigate any adverse effects of the non compliance	
i) Action taken or that will be taken to prevent recurrence of the non compliance	

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL:_____

Attachment 2

LICENCE NUMBER: L7782/2002/6 **FILE NUMBER:** DEC7348

SECTION C - SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report may only be signed by a person(s) with legal authority to sign it. The ways in which the Annual Audit Compliance Report must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this Annual Audit Compliance Report is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		The Annual Audit Compliance Report must be signed and certified:
an individual	☐	by the individual licence holder, or
	☐	by a person approved in writing by the Chief Executive Officer of the Department of Environment and Conservation to sign on the licensee's behalf.
A firm or other unincorporated company	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A corporation	☐	by affixing the common seal of the licensee in accordance with the Corporations Act 2001; or
	☐	by two directors of the licensee; or
	☐	by a director and a company secretary of the licensee, or
	☐	if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A public authority (other than a local government)	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
a local government	☐	by the chief executive officer of the licensee; or
	☐	by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of $50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____ SIGNATURE: _____

NAME: (printed) _____ NAME: (printed) _____

POSITION: _____ POSITION: _____

DATE: _____/_____/_____ DATE: _____/_____/_____

SEAL (if signing under seal)

LICENCE NUMBER: L7782/2002/6
LICENCE FILE NUMBER: DEC7348
APPLICATION DATE: 27/02/2012
EXPIRY DATE: 2/05/2017

PREMISES DETAILS

LICENSEE
Brodan (WA) Pty Ltd
18 Gibbs Road
NOWERGUP WA 6032

ACN: 130 026 274

PREMISES
Northsands Resources
Lot 6 on Diagram 34734 Wesco Road
NOWERGUP, WA 6032
(As depicted in Attachment 1)

PRESCRIBED PREMISES CATEGORY

Table 1: Prescribed premises categories

Category number*	Category Description*	Category Production or Design Capacity*	Premises Production or Design Capacity#	Premises Fee Component**
13	Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned.	1000 tonnes or more per year	45,000 tonnes per year	Not more than 50 000 tonnes per year
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or reuse.	500 tonnes or more per year	5000 tonnes per year	More than 500 but not more than 5000 tonnes per year
63	Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	500 tonnes or more per year	20,000 tonnes per year	More than 5000 but not more than 50 000 tonnes per year
67(A)	Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils.	1000 tonnes or more per year	60,000 tonnes per year	More than 5000 but not more than 50 000 tonnes per year
70	Screening, etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	More than 5000 but less than 50 000 tonnes per year.	60,000 tonnes per year	Not applicable

* From Schedule 1 of the Environmental Protection Regulations 1987
# From application
** From Schedule 4 of the Environmental Protection Regulations 1987

This Environmental Assessment Report (EAR) has been drafted for the purposes of detailing information on the management and mitigation of emissions and discharges from the prescribed premises. The objective of the EAR is to provide a risk assessment of emissions and discharges, and information on the management of other activities occurring onsite which are not related to the control of emissions and discharges from the prescribed premises activity. This does not restrict the Department of Environment and Conservation (DEC) to assessing only those emissions and discharges generated from the activities that cause the premises to become prescribed premises.

Basis of Assessment
The Northsands Resources, which has been assessed as a "prescribed premises" under category numbers 13, 62, 63, 67A and 70, within Schedule 1 of the *Environmental Protection Regulations 1987*.

- Category 13: Crushing of building material: premises on which waste building or demolition material (for example, bricks, stones or concrete) is crushed or cleaned,
- Category 62: Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or reuse,
- Category 63: Class I inert landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial,
- Category 67(A): Compost manufacturing and soil blending: premises on which organic material (excluding silage) or waste is stored pending processing, mixing, drying or composting to produce commercial quantities of compost or blended soils, and
- Category 70: Screening, etc. of material: premises on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.

Northsands resources accepts building and demolition waste materials (bricks, stones, concrete and associated plastics, timber, metal that can be recovered), inert wastes as defined in Landfill waste Classification and waste definitions 1996 9As amended), solid wastes including green wastes for mulching and Acid Sulphate Soil (ASS) for neutralisation. The anticipated throughput for each of the categories are as follows:

- Category 13: 45,000 tonnes per year;
- Category 62: 5000 tonnes per year;
- Category 63: 20,000 tonnes per year;
- Category 67(A): 60,000 tonnes per year; and
- Category 70: 60,000 tonnes per year.

1.0 BACKGROUND

1.1 GENERAL COMPANY DESCRIPTION

Northsands Resources is a West Australian family owned business that produces limestone and sand from quarrying operations and recycles waste materials. The company also owns Quinns Coastal Earthmoving, a small cartage and civil earthworks business which supplements the extractive and recycling activities. The company has been operating at this location for six years with environmental protection licence from DEC.

1.2 LOCATION OF PREMISES

The premises is located at Lot 6 on Diagram 34734 Wesco Road, Nowergup within the City of Wanneroo. The property is also located within the Swan Coastal Plain. The premises is surrounded by bushland on the north, bushland and extractive industry (Meteor Stone) on the east, chicken farm on the south and bushland and intensive agriculture on the west.

The site has been used for extractive industry (sand and limestone), soil blending, crushing and screening of soil and aggregate, mulching of green waste and composting, Acid Sulphate Soil (ASS) neutralisation and temporary stockpiling of neutralised ASS prior to blending.

The Environmental Protection Authority's *Separation Distances between Industrial and Sensitive Land Uses* (EPA 2005) recommends a minimum separation distance of 200m between solid waste depots and sensitive receptors (residences) due to potential impacts of noise, dust and odour. The closest residence appears on aerial mapping to be located approximately 300m east of the premises. Therefore, the premises is outside the recommended buffer area.

The depth to groundwater is approximately 40m across the site, with the groundwater having a marginal salinity range of 450mg/L TDS. There are no public groundwater bores located within 500 m of the site and no permanent wetlands are within 200 m of the site.

1.3 PROCESS DESCRIPTION

Crushing and screening

Northsands crushes and screens building demolition materials, such as concrete, brick and sand, to produce re-useable materials.

The crushing and screening of material and vehicle movements in and out of the site have the potential to cause dust emissions. However, dust emission is likely to be insignificant, considering the location of the premises and dust management measures adopted which include the use of water carts and water sprinkler system.

Asbestos may be present within the building demolition materials. Northsands does not accept any asbestos. The material acceptance criteria are displayed on the signage at the entrance of the premises. In the event of any asbestos is identified in a load, it is returned with the driver. Asbestos will be managed in accordance with the Asbestos Management Plan 2012 submitted by Northsands. However, additional conditions for asbestos management will be required.

Solid waste depot

Northsands accepts solid waste and stores it within a dedicated area for sorting. Sorting operations are carried out manually. Any green waste, timber and plastics received with the solid waste are separated on site. Timber and plastics are sent off to Tamala Park. Green wastes are mulched as required. Inert solid wastes are buried in the landfill.

Compost manufacturing and soil blending

Northsands accepts acid sulfate soil from Perth Metropolitan area and treats them in accordance with the Acid Sulfate Soil Management Plan, November 2011 approved by DEC's contaminated site branch. The treated (neutralised) soil is transported off to Amazon Soil. The treatment of acid sufate soil refers to compost manufacturing and soil blending. Northsands does not do any compost manufacturing as such.

Acid sulphate soil is stored within a dedicated bunded area to ensure any leachate is not discharged to the environment. Three monitoring bores have been installed at the appropriate positions upstream and downstream. The monitoring data will be the indicator if any water pollution occurring.

Screening etc. of material

Northsands extracts limestone and sand under the Extractive Industries licence from the City of Wanneroo and undertakes screening activities to obtain materials of required sizes as per the market demands. The noise and dust may become an issue. However, considering the location of the premises and dust management system in place, the risk of dust emission will be insignificant. Noise is not considered to be an issue at this premises considering the operating hours 7.00 am to 5.00 pm of the premises.

DEC has issued guidelines "Managing asbestos at construction and demolition waste recycling facilities" to provide guidance on measures that can be used by C&D recycling facilities to manage the risk of asbestos contamination of feedstocks and products to reduce risks to the community. Conditions have been added to the licence to assess the current operations against the guidelines and to agree and implement an improvement program to achieve compliance with them.

1.4 REGULATORY CONTEXT

1.4.1 Part IV *Environmental Protection Act 1986*, Environmental Impact Assessment

The premises has not been assessed under part IV of the Act

1.4.2 Part V *Environmental Protection Act 1986*, Environmental Management

The Northsands Resources has been assessed as a "prescribed premises" under Categories 13, 62, 63, 67(A) and 70 within Schedule 1 of the *Environmental Protection Regulations 1987* and requires a Licence for the activities at the premises.

Other relevant legislation includes:

- Environmental Protection (Unauthorised Discharges) Regulations 2004;
- Environmental Protection (Controlled Waste) Regulations 2004;
- Environmental Protection (Noise) Regulations 1997; and
- Landfill Waste Classification and Waste Definitions 1996 (As amended).

DEC policy position/guidance statements relevant to this premises includes:

- *Asbestos Fact Sheet: Disposal of material containing asbestos* (DEC); and
- *Guidance Statement No. 3: Separation distances between industrial and sensitive landuses* (EPA, 2005).

Management Plan submitted by the proponent includes:

- Acid Sulfate Soil Management Plan, November 2011 authored by Faron Mengler for Northsands Resources will apply for day to day operation.

1.4.3 Other Decision Making Authorities' Legislation which applies

The Department of Health (DOH) is responsible for enforcing the Health Act 1911 and subsidiary Health (Asbestos) Regulations 1992. DOH delegates authority to the Local Government Authority to enforce this legislation.

The Department of Commerce (WorkSafe) is the responsible agency for licensing asbestos removal.

Safe Work Australia is an Australian Government statutory agency, with the primary responsibility of improving work health and safety and workers' compensation arrangements across Australia.

The National Occupational Health and Safety Commission (NOHSC) has released various publications including the Code of Practice for the Management and Control of Asbestos in the Workplace.

The Department of Mines and Petroleum is responsible for enforcing dangerous goods legislation.

1.4.4 Local Government Authority

The premises is located within the City of Wanneroo. Planning approval for the development of this premises is obtained from the City of Wanneroo.

2.0 STAKEHOLDER AND COMMUNITY CONSULTATION

SUBMISSIONS RECEIVED DURING 21 DAY PUBLIC COMMENT PERIOD

The Application for Licence details for this facility was advertised in the West Australian newspaper on 19 March 2012 as a means of advising stakeholders and to seek public comments. No submissions were received.

3.0 EMISSIONS AND DISCHARGES RISK ASSESSMENT

DEC considers that conditions should focus on regulating emissions and discharges of significance. Where appropriate, emissions and discharges which are not significant should be managed and regulated by other legislative tools or management mechanisms.

The following section assesses the environmental risk of potential emissions from the Northsands Resources. In order to determine the site's appropriate environmental regulation, an emissions and discharges risk assessment was conducted of the Northsands Resources using the environmental risk matrix outlined in Appendix B. The results of this are summarised in Table 2.

Table 2: Risk assessment and regulatory response summary table.

Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DEC Regulation (EP Act - Part V)	EAR Reference	Other management (legislation,tools,agencies)
Air emissions (point source)	N/A	N/A	N/A	N/A	N/A	General provisions of the *Environmental Protection Act 1986* (EP Act)
Dust emissions	2-The activities in particular crushing and screening of building material, stockpile, open areas and transport have the potential to cause dust emissions. Water sprinkler system will be used to manage air borne dust. Improvement conditions relating to compliance with the guidance document "Asbestos at construction and demolition waste recycling facilities."	Medium- Nearest sensitive receptors are about 300 m away.	D–dust management conditions	LIC – Standard dust conditions An Improvement Programme to assess against the "Asbestos at construction and demolition waste recycling facilities" Guidelines to be included on the licence.	N/A	UD Regulations, Code of Practice EMP or EMS
Odour emissions	1-Not significant. Acid sulphate soil treatment is referred to compost manufacturing and soil blending on this premises. Treated soil is send off to Amazon soil company.	No interest – Nearest sensitive receptors are about 300m away	D- Odour management conditions	LIC– Standard odour conditions	N/A	Code of Practice, State Guidelines, EMP or EMS
Noise emissions	1- The crushing operations create noise emissions although the operating hours are restricted to 7am and 4pm Monday to Saturday. Buffer of x300m to nearest resident will reduce noise risk.	No interest or concerns	E –No regulation	LIC– No conditions	N/A	EP Noise Regulations, Code of Practice, EMP or EMS
Light emissions	N/A, Operating hours 7.00 am to 5pm	N/A	N/A	LIC– no conditions	N/A	DEC, EMP or EMS, General provisions of the EP Act

Discharges to water	2- Not significant as there is no direct discharge to groundwater. The licesee has installed one monitoring bore upstream and two monitoring bores downstream for groundwater management purposes which will identify whether any discharges of leachates into groundwater are occurring.	Medium concerns about groundwater	D- other management/licence conditions	LIC – Groundwater monitoring conditions are required.	N/A	UD Regulations, Code of Practice EMP or EMS
Discharges to land	2- Not significant. There is the potential for stormwater to become contaminated by contact with the intermediate storage of putrescibles wastes and solids re dust on the ground	Low- No concerns	D- Other management/licence conditions	LIC – Conditions	N/A	UD Regulations, Code of Practice EMP or EMS
Solid / liquid wastes	2-Not significant. putrescibles wastes will not be buried on site . Green waste will be stockpiled, mulched and composted. Any asbestos identified on the premises will be managed in accordance with the Asbestos Management Plan 2012	Low – No concerns	D- Other management/licence conditions	LIC - conditions	N/A	Controlled Waste Regs, EMS
Hydrocarbon/ chemical storage	1 – Insignificant. No chemicals, waste oils or fuels are intended to be stored on the premises. Therefore the potential for emissions from this area are considered to be low.	Low – No concerns	E – standard condition	LIC – conditions Standard conditions apply to hydrocarbon storage and will be placed on the licence.	N/A	Dangerous Goods storage licence and relevant legislation (DOCEP), EMS
Native vegetation clearing	N/A	N/A	N/A	LIC –	N/A	Clearing permit pending (DMP), EMS
Contaminated site identification	N/A – Not assessed	N/A	N/A	LIC - No	N/A	Contaminated Sites Branch (DEC), Tenement Conditions and Closure Plan (DOIR), EMS

4.0 GENERAL SUMMARY AND COMMENTS

Northsands Resources facilty at Lot 6 on Diagram 34734 Wesco Road, Nowergup is an existing facility to conduct activities under category numbers 13, 62, 63, 67A and 70. The issues identified are noise, dust, acid sulphate soil and groundwater. The risk to the environment from the emissions of activities at the premises is considered to be low and it can be managed by appropriate licence conditions.

The licence conditions for this premises have been revised and amended as necessary following a site inspection on 16 April 2012.

Northsands has provided an Acid Sulfate Management Plan, November 2011, which has been approved by DEC's contaminated site branch. Northsands is to provide an Asbestos Management Plan.

Although the landfill is located on the Swan Coastal Plain, the waste types are wholly inert and groundwater monitoring will be undertaken to validate that the waste inputs meet the waste acceptance criteria.

On this basis the premises has been assessed as low risk and it is recommended that an extended licence be issued for a period of 5 years.

OFFICER PREPARING REPORT

Dr Bhabesh Das

Position: Senior Environmental Officer
Swan Regional Office
Department of Environment and Conservation
Telephone number

18/04/2012

ENDORSEMENT

Marko Pasalich

Position: Team Leader
Swan Regional Office
Department of Environment and Conservation
Telephone number

18/04/2012

APPENDIX B: EMISSIONS AND DISCHARGES RISK ASSESSMENT MATRIX

Table 3: Measures of Significance of Emissions

Emissions as a percentage of the relevant emission or ambient standard		Worst Case Operating Conditions (95th Percentile)			
		>100%	50 – 100%	20 – 50%	<20%*
Normal Operating Conditions (50th Percentil	>100%	5	N/A	N/A	N/A
	50 – 100%	4	3	N/A	N/A
	20 – 50%	4	3	2	N/A
	<20%*	3	3	2	1

*For reliable technology, this figure could increase to 30%

Table 4: Socio-Political Context of Each Regulated Emission

		Relative proximity of the interested party with regards to the emission				
		Immediately Adjacent	Adjacent	Nearby	Distant	Isolated
Level of Community Interest or Concern*	5	High	High	Medium High	Medium	Low
	4	High	High	Medium High	Medium	Low
	3	Medium High	Medium High	Medium	Low	No
	2	Low	Low	Low	Low	No
	1	No	No	No	No	No

Note: These examples are not exclusive and professional judgement is needed to evaluate each specific case

*This is determined by DEC using the DEC "Officer's Guide to Emissions and Discharges Risk Assessment" May 2006.

Table 5: Emissions Risk Reduction Matrix

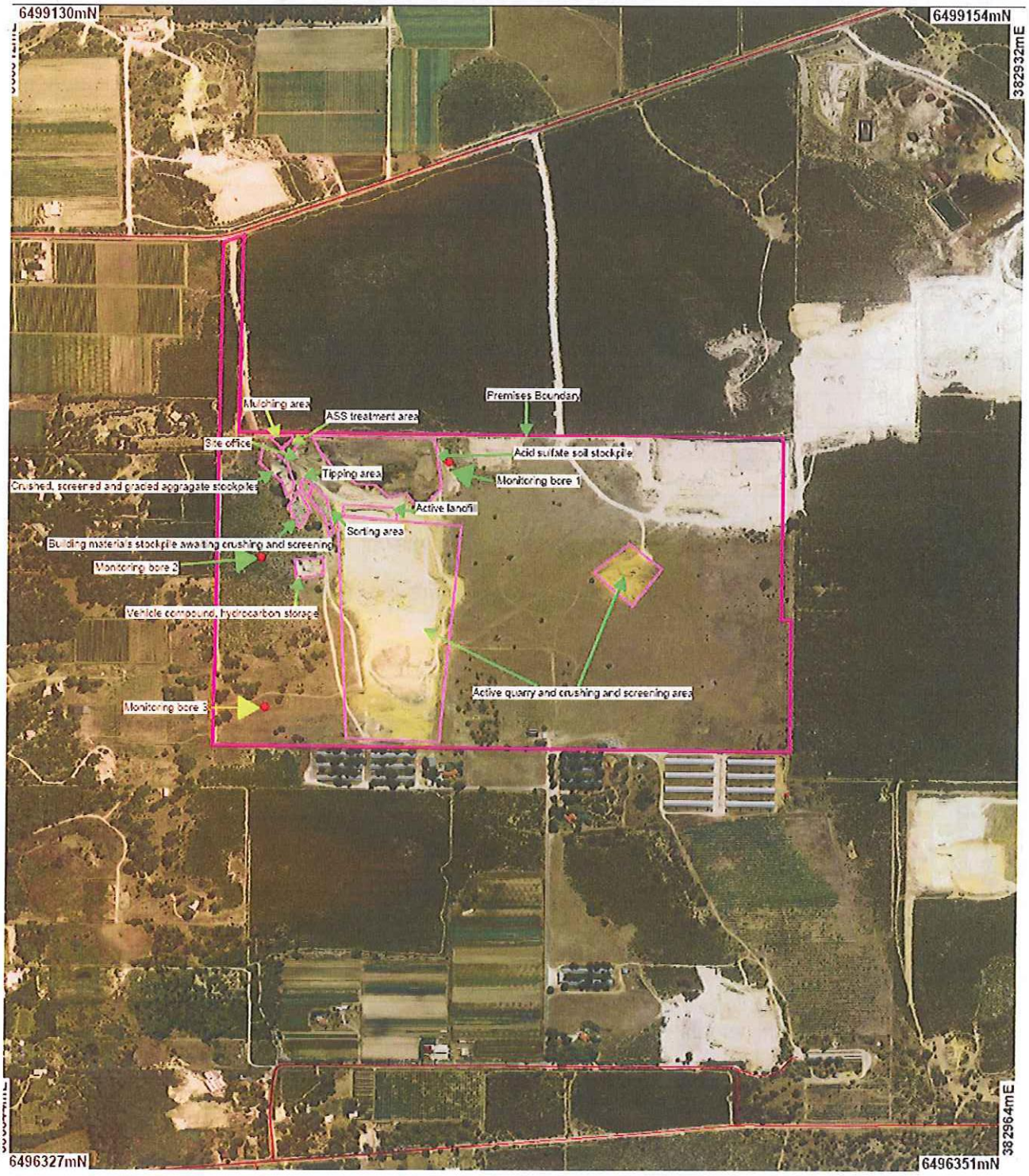
		Significance of Emissions				
		5	4	3	2	1
Socio-Political Context	High	A	A	B	C	D
	Medium High	A	A	B	C	D
	Medium	A	B	B	D	E
	Low	A	B	C	D	E
	No	B	C	D	E	E

PRIORITY MATRIX ACTION DESCRIPTORS
A = Do not allow (fix)
B = licence condition (setting limits + EMPs - short timeframes)(setting targets optional)
C = licence condition (setting targets + EMPs - longer timeframes)
D= EIPs, other management mechanisms/licence conditions (monitoring/reporting)/other regulatory tools
E = No regulation, other management mechanisms

Note: The above matrix is taken from the DEC Officer's Guide to Emissions and Discharges Risk Assessment May 2006.

Attachment 1

Plan of Premises



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APPENDIX B – Northsands Annual Monitoring Report May 2018

NORTHSANDS RESOURCES

ANNUAL MONITORING REPORT

MAY 2018

May 2018

NORTHSANDS RESOURCES

Licence Number ï 7782/2002/6

Occupier ï BRODAN (WA) Pty Ltd

18 Gibbs Rd Nowergup 6032, Perth WA

Name and location of Premises:
Northsands Resources
Lot 6 Wesco Road
Nowergup WA 6032

Quarry Manager:
Robert Topliss
0419 902 410
Office # 9407 4445

NORTHSANDS RESOURCES

ANNUAL REPORT 2018

i. **Measures taken to control pests and vermin**

All of our incoming Class 1 material is non-putrescible and sorted immediately for recycling.
We donôt have a problem with pests or vermin, even though foxes den in nearby bushland.
All stockpile areas and landfill operations are checked daily.

ii. **Number and severity of any fires on site**

No unplanned fires of any size have occurred on the site to report.

iii. **Measures to suppress dust**

A road sprinkler system is in place.
A wet down area for trucks is on site
A 15000 litre and 20,000 litre water truck are used as required.

Sprinkler heads on crushers and screens, fed by bore water.

iv. **Measures to control windblown waste**

A vehicle does drive around checking am & pm daily, and collects waste during the inspection.

v. **Average compaction rates**

Compaction is made by running over the surface of the landfill area with a bulldozer. The estimated compaction rate is 10 ï 20%

Any site boundaries

No changes to any boundaries have been made.

Complaints

Nil complaints have been received concerning any environmental issues.

Exceeding licence limits

Our sand and limestone production was high again, but had amended Category 70 to Category 12 production limits to address this.

Acid Sulphate Soils Management Plan

No Acid Sulphate soils were brought in and treated at our facility during this reporting period.

Water Sampling

Water samples were taken and sent to a NATA registered laboratory. **NB Individual test results are included with this report**.

We have also included a comparison from those results averaged across the three test bores demonstrating there is no contamination entering the local groundwater from our operation. It should be noted, also, that this area is farm land and there are fertilisers and chicken sheds on surrounding properties that may impact on local groundwater. (See comparison below)

Dissolved in water	**Dec 2015**	**June 2016**	**Dec 2016**	**June 2017**	**Dec 2017**
pH in water	7.5 pH units	7.5 pH units	7.37mg/L	7.3 pH units	7.06 pH units
Total diss. solids	463 mg/L	450 mg/L	423.3 mg/L	460 mg/L	466 mg/L
Calcium	73 mg/L	53.5 mg/L	63.3mg/L	53 mg/L	56.33 mgL
Elect conductivity	773 uS /cm	760 uS /cm	707 uS /cm	770 uS/cm	780 uS /cm
Potassium	5.3 mg/L	3.7 mg/L	4.9mg/L	4.1 mg/L	4.03 mg/L
Magnesium	15.3 mg/L	12 mg/L	13.3mg/L	12.3 mg/L	12.33 mg/L
Sodium	101.1 mg/L	70 mg/L	79.6mg/L	80 mg/L	76 mg/L
Chloride	113.3 mg/L	120 mg/L	120 mg/L	127 mg/L	120 mg/L
Sulphate	44.67 mg/L	40 mg/L	44.3 mg/L	39.3 mg/L	42.33 mg/L
Total Nitrogen	1.47 mg/L	1.7 mg/L	3.16mg/L	2.0 mg/L	0.5 mg/L
Total Phosphorus	1.4 mg/L	<0.05 mg/L	<1.5mg/L	<1.7 mg/L	1.6 mg/L
Aluminium	<0.001mg/L	<0.01mg/L	<0.01mg/L	<0.01 mg/L	<0.01mg/L
Manganese	<0.05 mg/L	<0.005mg/L	<0.01mg/l	<0.034 mg/L	<0.034 mg/L
Arsenic	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.001mg/L
Cadmium	<0.001mg/L	<0.001mg/L	<0.0001mg/L	<.0001mg/L	<0.0001mg/L
Chromium	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.001mg/L
Copper	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.0026mg/L	<0.007mg/L
Lead	<0.001mg/L	<0.001mg/L	<0.001mg/L	<0.001 mg/L	<0.001mg/L
Mercury	<0.0005mg/L	<0.00005mg/L	<0.00005mg/L	<0.00005mg/L	<0.00005 mg/L
Nickel	<0.001 mg/L	<0.001mg/L	<0.001mg/L	<.0013mg/L	<0.001mg/L
Zinc	0.0043 mg/L	<0.001mg/L	.013mg/L	<.0023mg/L	.007 mg/L
Iron	<0.01 mg/L	<0.01mg/L	.33mg/L	<.016mg/L	<.01 mg/L

June 2017:SWL ï BH1 = 41.5m; BH2 = 38.2m; BH3 =38m

Dec 2017: SWL ï BH1= 41.5m; BH2=38.1m; BH3 = 38 m

May 2018

Robert Topliss

Quarry Manager
Company director
Northsands Resources
Brodan (WA) Pty Ltd

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APPENDIX C – Aboriginal Heritage Site search results

Search Criteria

1 Registered Aboriginal Sites in Custom search area - Polygon - 115.747915239376°E, 31.6461306632733°S (GDA94) : 115.760596723599°E, 31.6460575951691°S (GDA94) : 115.760746927303°E, 31.6537294325226°S (GDA94) : 115.747700662655°E, 31.6537659635666°S (GDA94) : 115.747722120327°E, 31.6532727932612°S (GDA94) : 115.747915239376°E, 31.6461306632733°S (GDA94)

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land within or adjacent to the following Indigenous Land Use Agreement(s): Whadjuk People ILUA.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines, Industry Regulation and Safety (DMIRS) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMIRS, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at https://www.dpc.wa.gov.au/swnts/South-West-Native-Title-Settlement/Pages/default.aspx.

Further advice can also be sought from the Department of Planning, Lands and Heritage at heritageenquiries@dplh.wa.gov.au.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.

Status:

- Registered Site: The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972.*
- Other Heritage Place which includes:
  - Stored Data / Not a Site: The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972.*
  - Lodged: Information has been received in relation to the place, but an assessment has not been completed at this *stage* to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972.*

Access and Restrictions:

- File Restricted = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- File Restricted = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact heritageenquiries@dplh.wa.gov.au.
- Boundary Restricted = No: Place location is shown as accurately as the information lodged with the Registrar allows.
- Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- Restrictions:
  - No Restrictions: *Anyone* can view the information.
  - Male Access Only: Only *males* can view restricted information.
  - Female Access Only: *Only* females can view restricted information.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

Basemap Copyright

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
4404	ORCHESTRA SHELL CAVE.	Yes	Yes	No Gender Restrictions	Registered Site	Artefacts / Scatter, Engraving, Arch Deposit, BP Dating: 6500BP to 1730BP, Other: PA 19, NE	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	S00051

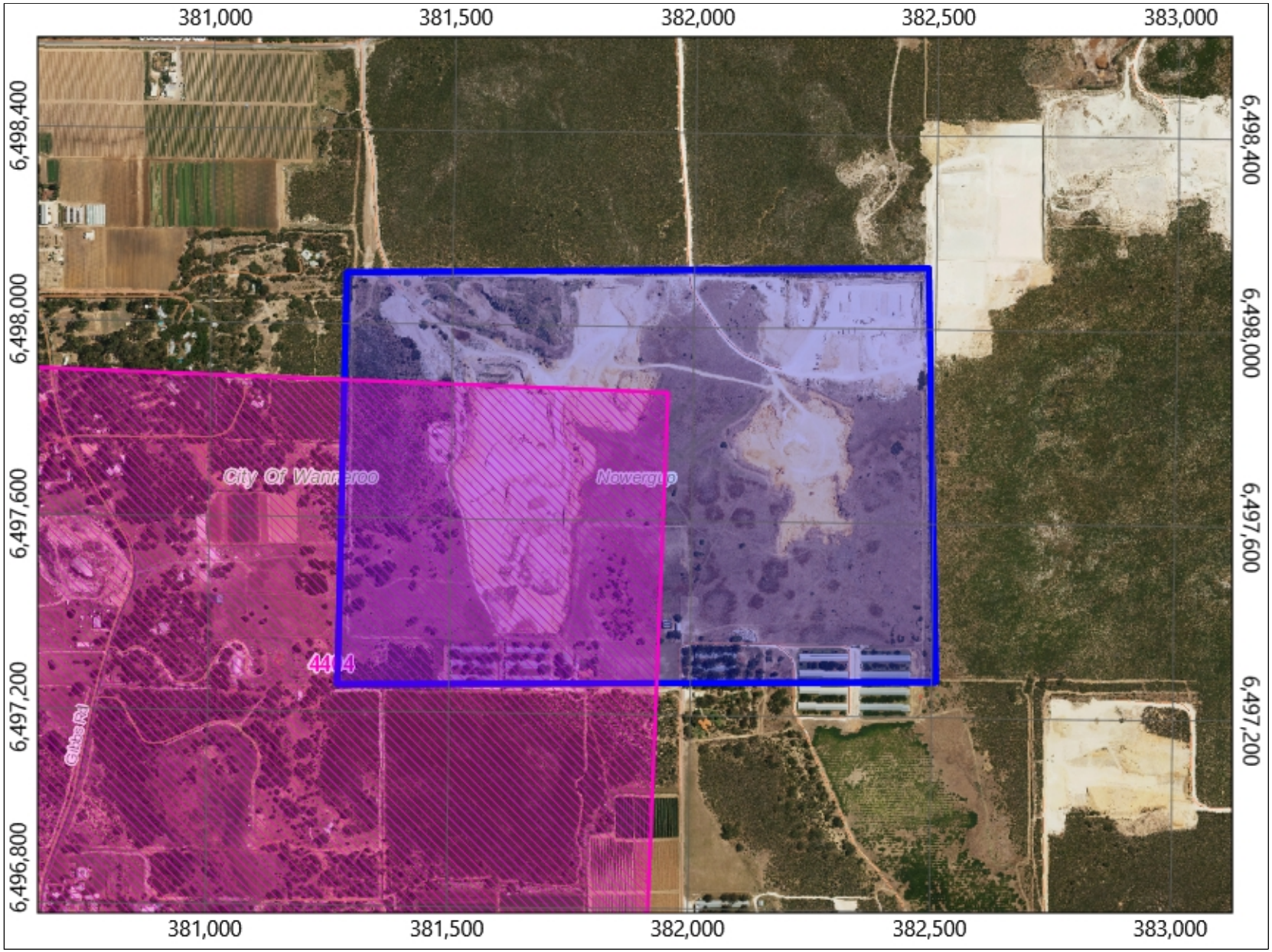
Department of **Planning, Lands and Heritage**

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

For further important information on using this information please see the Department of Planning, Lands and Heritage's Terms of Use statement at http://www.daa.wa.gov.au/Terms-Of-Use/



Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

0.46 kilometres

Map Scale 1 : 14,000

MGA Zone 50 (GDA94)

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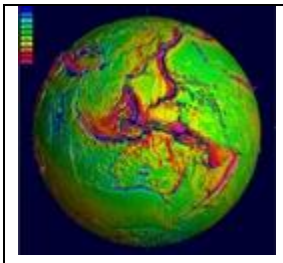
APPENDIX D – Desktop Karst Study (Western Geophysics, 2015)



WESTERN GEOPHYSICS PTY LTD.

Technical Report

October 2015

Project Title: **Desktop Karst Assessment Study, Northsands Project Area City of Wanneroo WA.**

Client: CoTerra Environment
2/460 Roberts Road, Subiaco WA 6008.

Date: October 2015.

Report Author : Steve Massey.

Company: Western Geophysics Pty Ltd
137 Petra St, East Fremantle
Perth, Western Australia, 6158.
Tel: 0419921821.

Table of Contents.

Appendices.

1. Executive Summary

Within City of Wanneroo, Northsands Resources are applying for an Extractive Industry Licence to enable the extraction of sand and limestone.

The purpose of this work is to complete a desktop study to assess the potential for Karstic structures to be developed within the area of the proposed application area with recommendations for limited geophysical testing if warranted.

The Tamala Limestone unit LS2 is identified as high risk and Karst prone, occurring within a belt which is located 5km inland from the coast and approximately 22km long.

Karst structures in the form of caves are known to occur within 30m of the western boundary of the application area.

The geomorphology of the application area has been studied using very high resolution (sub-decimeter) UAV survey imagery and elevation data. This analysis shows the geomorphology, the surface slope and inferred water-flow directions do indicate there are two closed basin surface depressions where run-off water may accumulate and infiltrate the sub-surface.

This study does not explicitly identify karst structures per se, but it does recognise a geomorphological setting that could be conducive to karst development below the surface which may be covered by surficial sand deposits.

A site visit to identify the location and possible size of the two caves near the western boundary of the application area is recommended.

Two lines of electrical resistivity tomography are recommended in the central area of the application in order to image the subsurface to a depth of 30m and determine if subsurface caves are present.

2. Introduction

Extensive areas of limestone within the City of Wanneroo have known geological potential for the development of Karst structures.

Previous work has identified these structures at numerous sites within the city boundaries. These structures are generally caves, solution pipes, pinnacles and subsidence dolines.

The City of Wanneroo has developed policies (LPP 4.13) with the objectives of:

1. Conserving caves and significant karstic features for their geological, cultural and environmental values; and to

2. Minimise risks to people and property in karst hazard areas.

Northsands Resources are applying for an Extractive Industry Licence within the City of Wanneroo to enable the extraction of sand and limestone (Figure 1).

A desktop study of the application area has been requested by environment consultant CoTerra Environment Pty Ltd. The purpose of this work is to assess the potential for Karstic structures to occur within the area of the proposed application area with recommendations for limited geophysical testing if warranted.

3. Previous Geological and Karst Work

The geological information used in this report is predominantly sourced from the 1:50,000 scale Yanchep and Muchea Environment Geology Series maps (Gozzard J.R. 1982), published by the Geological Survey of Western Australia (GSWA). On request, the GSWA have also provided digital located data that identify Karst structures and their location within the area of the two map sheets. A map of the Tamala limestone units and known karst structures in the area surrounding the application area is shown on figure 2.

Karst hazard review work by Daniella Csaky published in 2003 by Geoscience Australia has identified the main karst structural types and hazards within the karst prone belt.

Within the Tamala Limestone, Gozzard mapped a Karst prone belt which is 5km inland from the coast and approximately 22km long stretching from Yanchep to just south of Flynn Drive within the City of Wanneroo. The Karst belt is typically 800-1200m wide, occupying the slopes and floor of a valley which has a number of small lakes and associated peaty – clayey soils. The high risk limestones that occupy the belt are mapped as the LS2 unit. Gozzard describes LS2 as light yellowish brown, with coarse grained quartz with abundant Karst structures including caves, dolines and swallows. The medium risk LS1 unit has the same geological description but is without significant Karstic structure development.

Csaky pointed out that the LS2 unit has a total carbonate content of 80%, which is much greater than that of the LS1 unit. This compositional difference therefore allows for more rapid and extensive dissolution of the LS2 rock by ground and meteoric water resulting in a higher potential for karst development.

In Wanneroo, karst structures were predominantly formed by previous high groundwater levels (Bastian, 2003). Csaky gives several examples where surficial sands have covered pre-existing karst structures and collapse at the surface has occurred through rapid water infiltration and also vehicle movements.

The database provided by the GSWA describes each site with a Karst code (Karst structure), Karst class (with or without known groundwater flow) and a name if known e.g. “Yallingup Cave”.
Karst structures known to occur in the Wanneroo City area include Dolines, Caves, Sinkholes and Cave swallows (see Appendix C -nomenclature for definitions of these).

4. Site Analysis and Interpretation

Figure 3 shows the very high resolution orthophoto over the application area. The orthophoto and associated very high resolution (<10cm) digital elevation model (DEM) data were acquired by Austin Surveys Pty Ltd using a UAV system (figure 4). These data were obtained by WGPX to aid in the geomorphological analysis of the site. The site has two pits from which material extraction has taken place. The analysis of the geomorphological surface has been completed using both the Terra Explorer and Global Mapper software packages.
The GSWA and/or the WA. Speleological Society have identified two caves that are located approximately 30m to the west of the western pit wall and near the western boundary of the application area. The size and depth extent of the caves is not documented in the database. Based on the GSWA mapping, the caves are developed near or at the contact of the LS1 and LST units at an elevation of 64m. Inspection of the high resolution image suggests the caves are developed within a caprock of ridge forming solidified calcrete. Three dimensional visualisation of the orthophoto combined with the elevation model shows there are also calcrete layers within the western pit.
The highest elevation of the natural surface is approximately 80m and is located at the north eastern corner of the application area. The natural surface slopes to the south with the elevation at the southern boundary being approximately 60m.
Figure 4 shows the elevation model of the site with interpreted features from slope and slope direction modelling. The NNE-SSW elevation profile shows there are two closed surface depressions along the section line. The geomorphology and the surface slope directions indicate there are a number of areas where surface water may accumulate and infiltrate the sub-surface. Possible infiltration sites are shown on the figure as circles with a diameter of 25m.
The geomorphology of the area between the pits has a geomorphology with two closed depressions. The depressions can be interpreted as natural landforms developed from deposition and erosional processes and/or as sites where there could be underlying karst development due to surface water infiltration with consequent sagging of the natural surface.

5. Conclusions and Recommendations

The purpose of this report is to complete a desktop karst assessment study using available data from the UAV site survey work, GSWA geological mapping and other public domain data.
There is nothing definitive in the data reviewed and analysis completed here that directly indicates the presence of karst structures within the application area.
Karst structures noted by the GSWA as two caves in their database are located as being within 30m of the western side of the application boundary. The western caves don't affect the application area and the proposed pit.

The study does recognise a geomorphological setting which could be conducive to karst development in the subsurface in an area between the two pits. The data suggest an 80m buffer zone to the east of the present pit boundary has much lower risk as this area is not within the depression low.
If extraction were to proceed beyond the buffer zone then I would recommend the following.

1. Two lines of electrical resistivity tomography (ERT) located in the central area of the application. The aim of this work would be to image the resistivity structure from the surface to a depth of approximately 20-30m. In karst areas, ERT is a commonly used geophysical method for this purpose where caves can be identified as very high resistivity anomalies within the resistivity depth sections.
2. I recommend looking at the caves only on the basis of doing that in conjunction with further investigation within the application area when and if warranted i.e. on decision to do ERT. The purpose being scientific to classify what karst could be within the application area.

APPENDIX A
Figures.

Figure 1. The Northsands Resources application area in the City of Wanneroo.

Figure 2. The geology of the application area and the immediate surrounds (top). The Karst prone, high risk LS2 unit is coloured green and the medium risk LS1 unit is coloured lilac. Known karst structures are shown as green stars. The section at the bottom is from Gozzard 1982. It shows the relationship of LS units to the water table. The section is generic and does not represent the geology below the application site.

Figure 3. Very high resolution UAV derived orthophoto over the application area. The green stars represent the location of known karst structures (GSWA database).

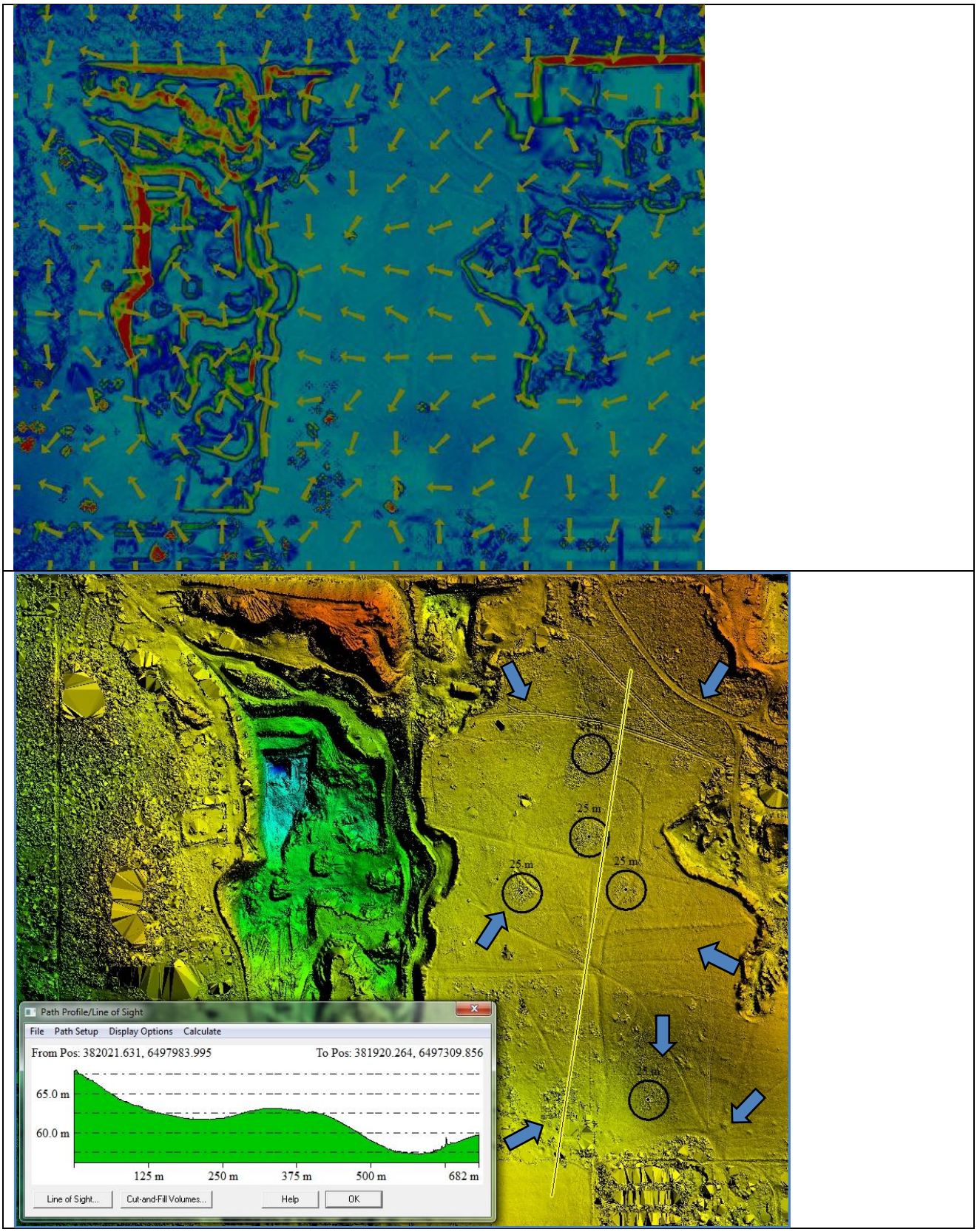


Figure 4. Slope angle map (colours) and slope direction (arrows) derived from the UAV derived DEM (top). The elevation profile and geomorphology based on the DEM (bottom) shows there are two closed surface depressions along the section line (yellow colour). Slope and interpreted surface water flow directions are indicated by the blue arrows. The 25m diameter circles indicate possible sites of surface water infiltration.

APPENDIX B

References

Bastian, L. V. (1991) *The hydrology and speleogenisis of Yanchep.* Proceedings of the 18th Biennial Speleological Conference, Margaret River, W.A. December 30, 1990 to January 5, 1991. Australian Speleological Federation Inc.

Csaky, D. 2003. Review of karst hazards in the Wanneroo area, Perth, Western Australia. Minerals and Geohazards Division, Geoscience Australia

Gozzard, J.R. (1982a) *Muchea Sheet 2034 I and part 3134 IV, Perth Metropolitan Region*, Environmental Geology Series, Geological Survey of Western Australia.

Gozzard, J.R. (1982c) *Yanchep Sheet 2034 IV, Perth Metropolitan Region* , Environmental Geology Series, Geological Survey of Western Australia.
Any journal or conference paper and many technical books demonstrate the referencing of other people's work.

APPENDIX C

Nomenclature

Caprock-A surface composed of Calcrete, especially where it is separated from the underlying rock by a clay or similar layer.

Cave- A natural cavity in rock, large enough to be entered by people. May be water filled. May also be blocked partly or fully by sediment and rock fragments. Commonly formed by solution in Limestone.

Cave System- A collection of caves linked by enterable passages, or linked hydrologically. Or a large cave with extensive complex of chambers and passages.

Doline Karst- Karst dominated by a closed surface depression draining underground in karst formed by solution and/or collapse of underlying rock strata. Shapes are variable, but often conical or bowl shaped.

Pinnacle Karst- Near vertical sided spires of cemented carbonate around the paleo-root zones of trees.

Pseuodokarst-Terrain with landforms (and caves) which resemble those of karst but are not the product of karst solution processes.

Sinkhole- In Australia, used for sites of sinking water in karst areas. Sinkholes also include swallets. This term is synonymous with the term DOLINE in the USA.

Solution Pipe- vertical cylindrical shaft, often about 0.5 m across and up to 20 m deep, which is a characteristic of syngenetic karst.

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